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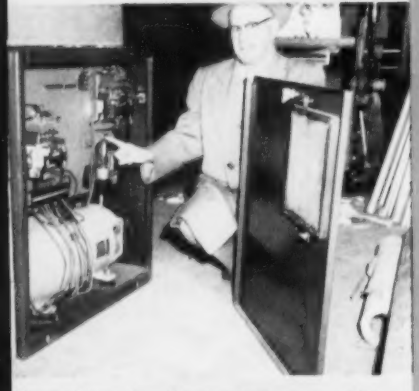

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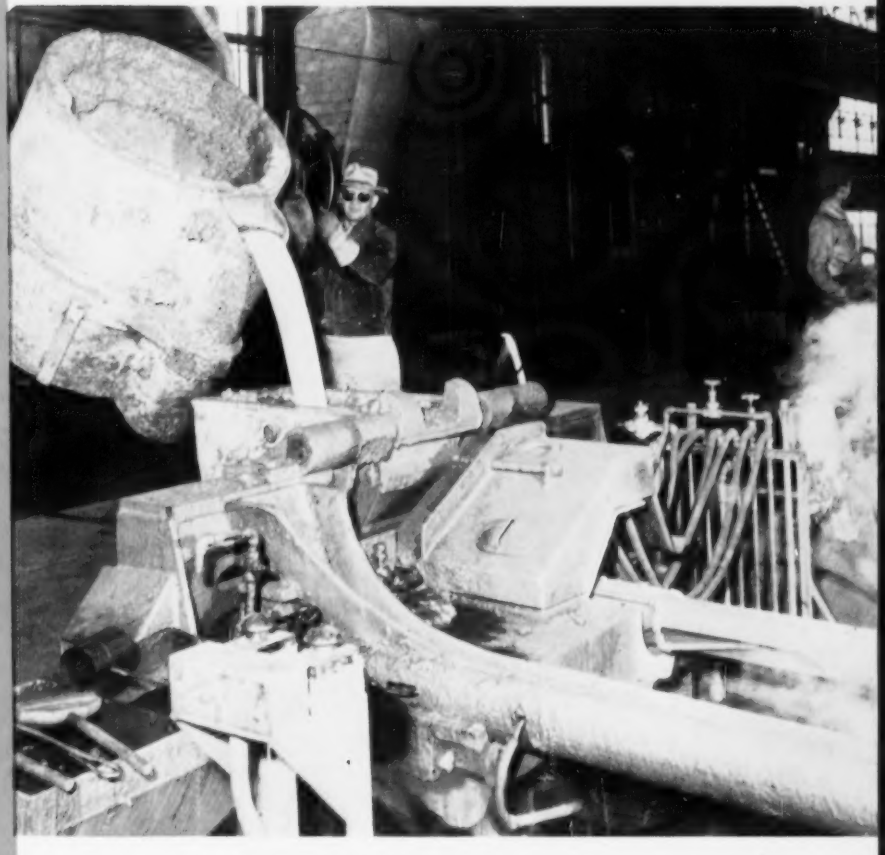
ELECTRICAL WEST

April 1957
25 Cents

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.



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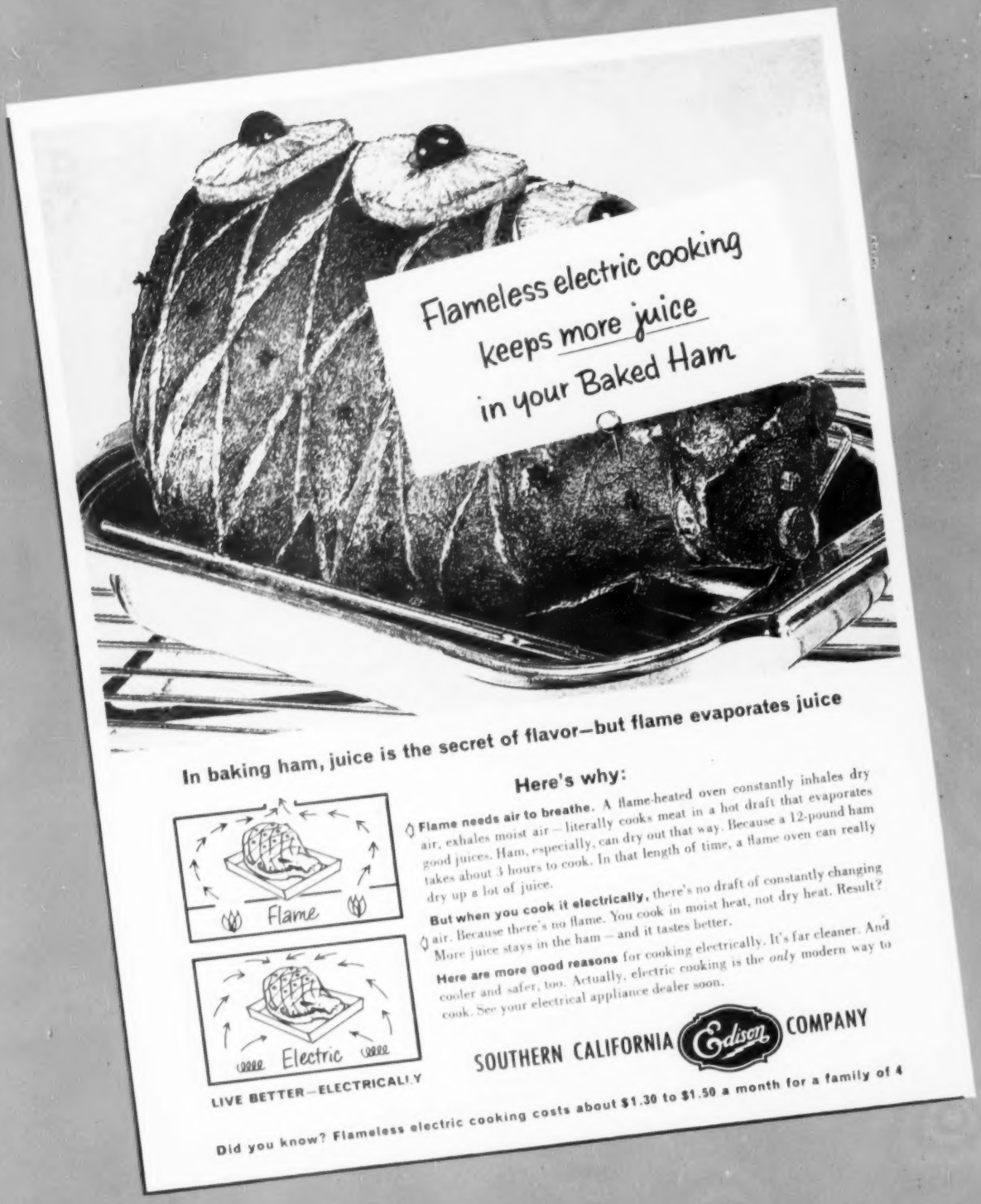


In baking ham, juice is the secret of flavor—but flame evaporates juice

Here's why:

◊ **Flame needs air to breathe.** A flame-heated oven constantly inhales dry air, exhales moist air—literally cooks meat in a hot draft that evaporates good juices. Ham, especially, can dry out that way. Because a 12-pound ham takes about 3 hours to cook. In that length of time, a flame oven can really dry up a lot of juice.

But when you cook it electrically, there's no draft of constantly changing ◊ air. Because there's no flame. You cook in moist heat, not dry heat. Result? More juice stays in the ham—and it tastes better.

Here are more good reasons for cooking electrically. It's far cleaner. And cooler and safer, too. Actually, electric cooking is the *only* modern way to cook. See your electrical appliance dealer soon.

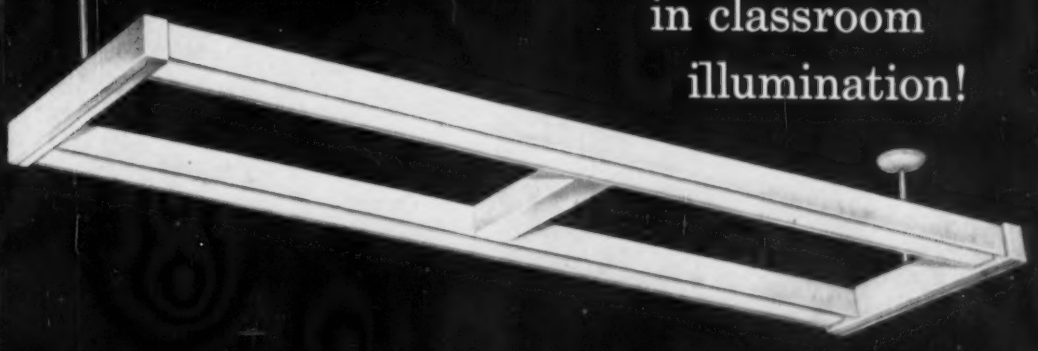
SOUTHERN CALIFORNIA Edison COMPANY

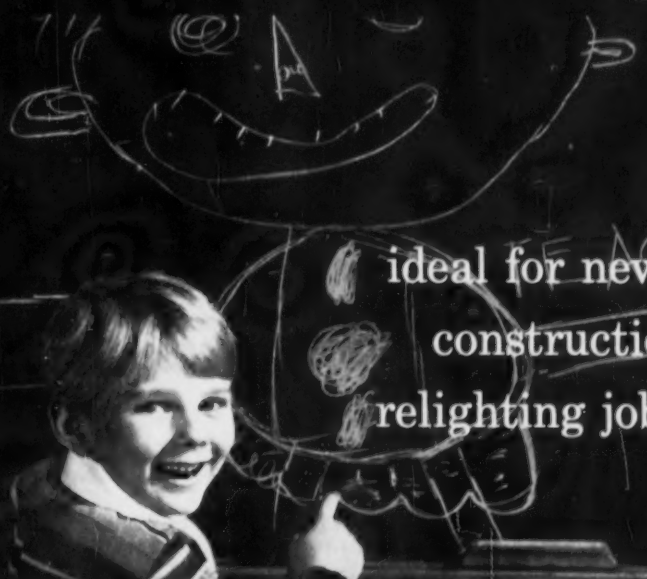
LIVE BETTER—ELECTRICALLY

Did you know? Flameless electric cooking costs about $1.30 to $1.50 a month for a family of 4

Edison is selling the advantages of electric cooking— to boost your electric range sales

PERFECT VISION... a new look in classroom illumination!





ideal for new construction or relighting jobs

Here is Smoot-Holman's incomparable new high output indirect luminaire for schools. Meets all A.S.A. requirements.

- LESS TENSION
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- DEEPER KNOWLEDGE PENETRATION

With the new 800 MA lamps, Perfect Vision will return more light—better light—per dollar than ever thought possible.

Contact your local Smoot-Holman lighting engineer or write direct for catalog PV-288

to **SMOOT-HOLMAN** INGLEWOOD, CALIF.

We support the National Lighting Bureau

service in the west and southwest for all school, commercial and industrial lighting

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

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Next Month

Coming next month—a report on a money-saving lightning protection scheme, the proceedings of the PCEA Engineering and Operating meeting at Los Angeles and a story on a cooking school program that got results.

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Entered as second class matter, Dec. 17, 1956, at the post office at Portland, Ore., under the act of March 3, 1879. Postmaster: please send notice 3579 to Electrical West, 68 Post St., San Francisco 4, Calif.

1 Aluminum-alloy bus

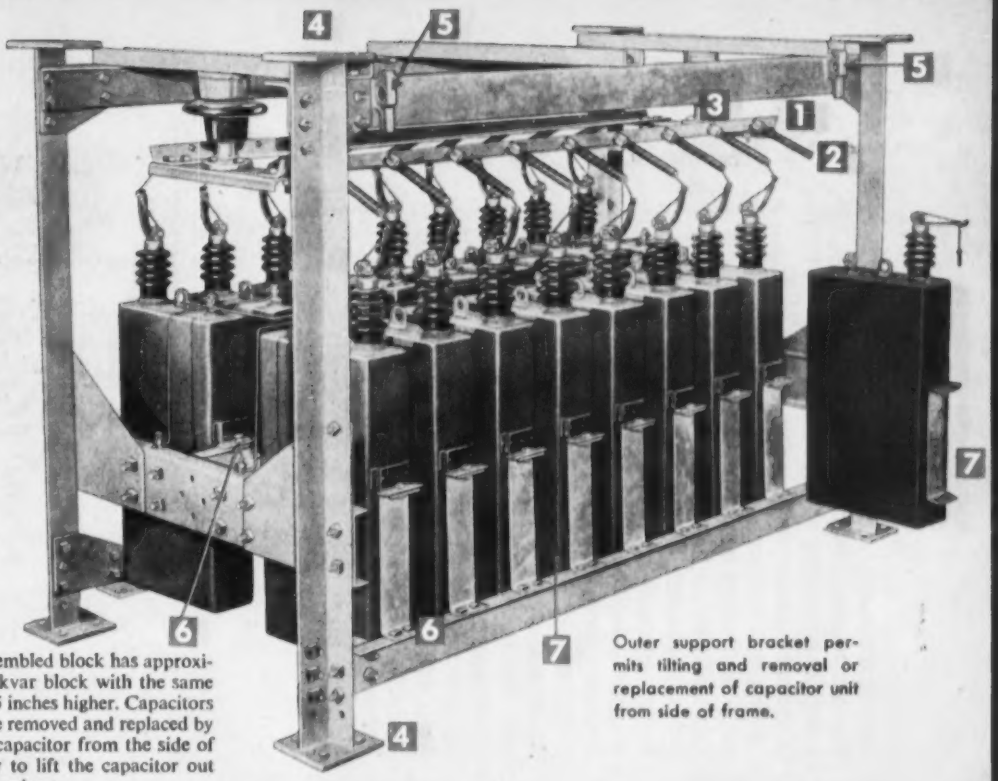
2 Bus-mounted fuses

3 Bus connections wire brushed and treated with oxidation inhibitor.

4 Jig-assembled for perfect alignment of mounting pad bolt holes.

5 Lifting lugs.

6 Tapped holes in frame for capacitor mounting bolts. Nuts not needed.



L-M's new 50 kvar factory-assembled block has approximately the same area as a 25 kvar block with the same number of units and it is only 5 inches higher. Capacitors in L-M's 50 kvar blocks can be removed and replaced by simply tilting and sliding the capacitor from the side of the block. It is not necessary to lift the capacitor out from between the mounting members.

Outer support bracket permits tilting and removal or replacement of capacitor unit from side of frame.

Another L-M First...

L-M's New 50 Kvar Capacitor Blocks Provide Kilovars At Still Lower Costs

By **BLAINE SCHULTZ**
Chief Engineer
Capacitors and Regulators
Line Material Industries

Only half as many units are required in substation capacitor banks when you use L-M's new blocks of 50 kvar capacitors. In addition, these blocks reduce the number of fuses, footings, and base support insulators, as well as the construction man-hours required for any given-size bank. L-M 50 kvar preassembled capacitor blocks also cost less and require about 50% of the substation area per kvar in comparison with blocks containing 25 kvar capacitors.

Capacitor Unit

The internal construction of L-M's 50 kvar capacitor is identical with that of the 25 kvar unit except for the length of pack. There is no increase in voltage stress to get the higher kvar rating. The new design is the result of continued improvement in dielectric materials and manufacturing techniques.

The tank has the same width, same thickness as the 25 kvar capacitor. Only 10 inches of additional height give you twice the capacity. It also has aluminum-metallized coating under alkyd resin paint; paragroove clamp-type terminals; strong solder-sealed bushings; and low-temperature Elemex liquid dielectric.

Factory-Assembled Blocks

L-M offers a complete line of NEMA Standard 50 kvar factory-assembled blocks from 2400 through 7960 volts—400 to 1200 kvar ratings in 100 kvar increments.

Outstanding features of L-M factory-assembled blocks include:

- Aluminum-alloy bus which is not subject to cold flow.
- Bus-mounted capacitor fuses with stainless-steel flipper to eject the leader if fuse link ever blows. Leader cannot hit live parts.
- Connections to the bus are wire brushed, and treated with oxidation inhibitor.
- Height of block is increased only 5 inches, because it is so designed that capacitors can be installed and removed from the *side*. It is not necessary to provide clearance to lift the capacitor out from between the mounting members.
- Heavy galvanized frame is jig-assembled for perfect alignment of mounting-pad bolt holes.

Prompt Delivery Now

You can save on the cost of equipment, man-hours, and space in the substation when you specify L-M NEMA-standard 50 kvar capacitor equipments. Prompt delivery . . . on all sizes and voltage ratings. Ask your L-M Field Engineer for complete information on L-M's new 50 kvar factory-assembled capacitor equipments. Or write Line Material Industries, Milwaukee 1, Wisconsin.

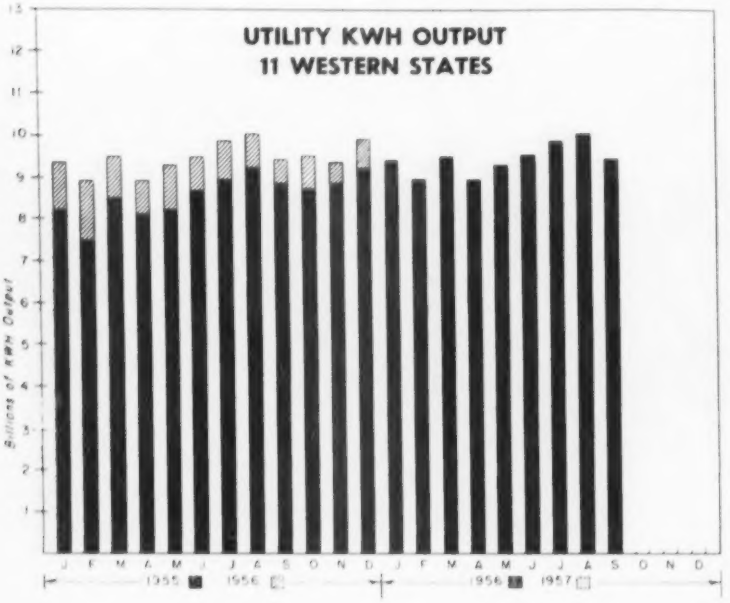
McGRAW EDISON

296-AR

LINE MATERIAL Industries *Elemex® Capacitors*

McGRAW-EDISON COMPANY

----How're We Doing?



Output Comparisons

Year-to-year Kwh Output Changes in Western Regions and U. S. Per Cent Changes Over Same Week One Year Ago

Week Ending	Rocky Mountain	Pacific Southwest	Pacific Northwest	U. S. Total
Feb. 2	+10.3	+11.1	+9.2	+6.8
Feb. 9	+ 6.1	+11.6	—2.5	+6.0
Feb. 16	+ 5.8	+ 5.0	—6.4	+5.5
Feb. 23	+ 8.5	+ 4.2	—2.9	+5.7
March 2	+ 2.5	+ 6.0	—4.9	+5.3

Earnings Report

New annual reports reflect the healthy earning position of Western utilities. Southern California Edison earned $3.44 per share, up from $3.28. Net income totaled $33,657,404 after tax payments of nearly $50,000,000. . . . Idaho Power pushed common stock earnings per share from $1.87 in 1955 to $2.18 in 1956. . . . California Oregon Power earnings reached $2.30 per common share up from $2.11 in 1955. . . . Puget Sound Power & Light earned $1.67 per share, 16c per share more than last year.

New Projects

Noteworthy additions to the commercial and industrial plant of the West include a new 240,000-sq-ft major distributing center to be opened by Westinghouse near Ogden to serve the entire Western region. . . . Safeway Stores broke ground for a $3,000,000 distribution center on a 100-acre site near Clackamas, Ore. . . . Western Hotels has announced a $3,000,000, 200-room addition to Portland's Benson Hotel. . . . Raytheon Mfg. Co. is building a new electronics laboratory at Santa Barbara, Calif. . . . Denver, Colo., is slated to get its new $6,000,000 Lakewood shopping center started late this year. . . . A $1,000,000 cement packaging and distribution center is to be built near Sacramento, Calif. . . . Tract construction of 250 homes is scheduled for La Jolla, Calif., at a cost of $2,500,000. . . . The Puget Sound area will have three new large oil refineries by 1960 — a $185,000,000 development. . . . Bethlehem Pacific Coast Steel will double the size of its Seattle plant in a $25,000,000 expansion program.

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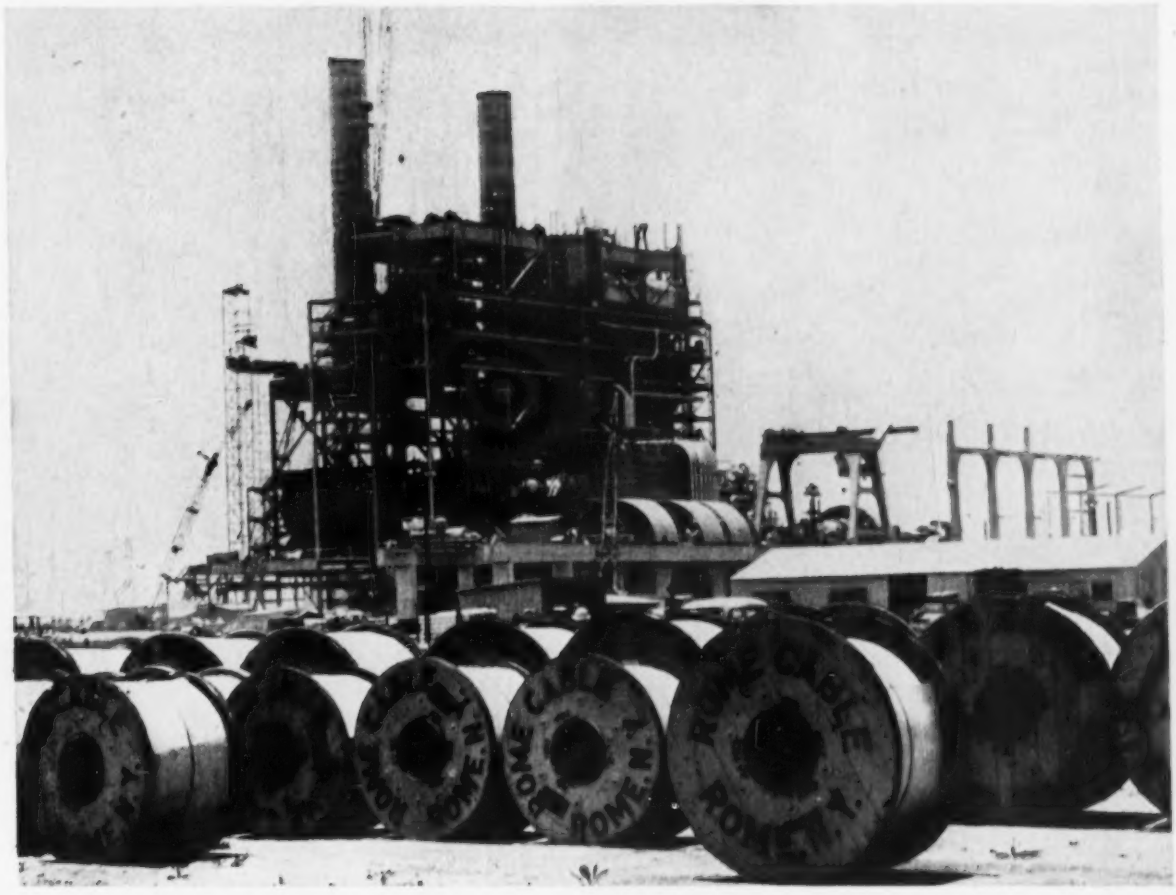
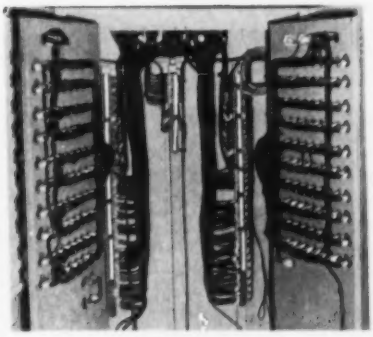


Southern California Edison installed . . .

¼ million feet of Rome control cable in new Alamitos steam station



EASY TO HANDLE, STRIP, SPLICE. The clean, low-friction surface of Rome's control cables enabled Alamitos workmen to pull the cable through conduits and into this cabinet quickly and easily.

For its station control circuits, this large West Coast utility selected high-quality Rozone-Roprene control cable —253,000 feet of it. This Rome cable is a logical choice for any such permanent installation since it represents the ultimate in control cable design and performance.

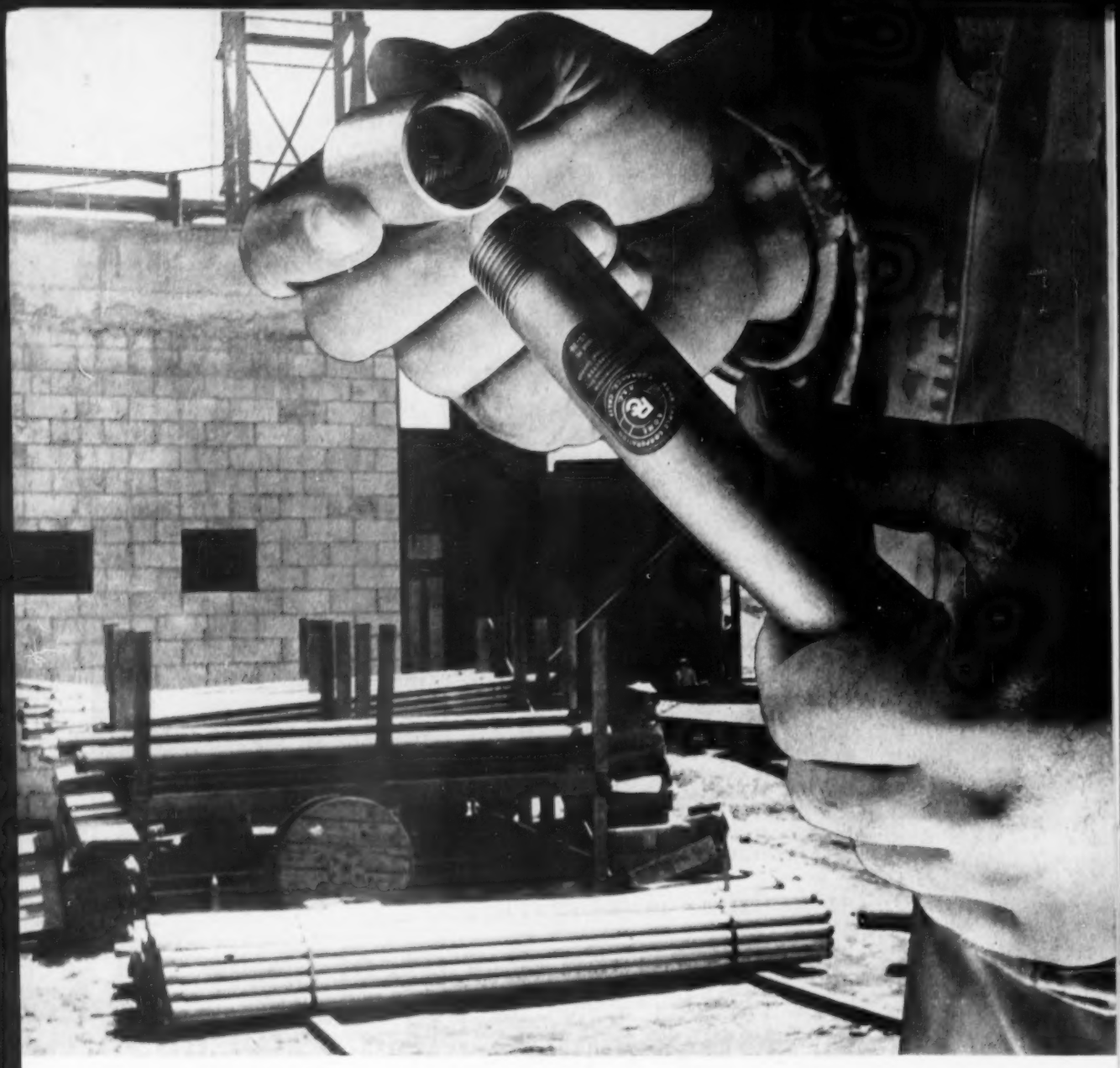
Built to last. Each conductor is insulated with a premium-quality, oil-base insulating compound—Rozone—which provides excellent protection against corona and ozone cutting. Rozone is also highly resistant to water and aging. Each individual conductor is then covered with a tight-fitting color-coded Roprene (neoprene) sheath.

Over-all protection is provided by a Roprene jacket, which not only resists weather, oils, chemicals, and even flame, but also provides a high resistance to mechanical injury during and after installation. And this tough Rome Cable material is virtually immune to corrosion and electrolysis.

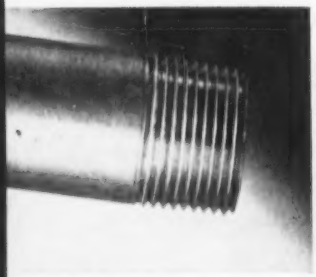
If you want the very best in station control cable for your next job, specify Rozone-Roprene. Contact your nearest Rome Cable representative for more information—or write to Department 803, Rome Cable Corporation, Rome, New York.

ROME CABLE

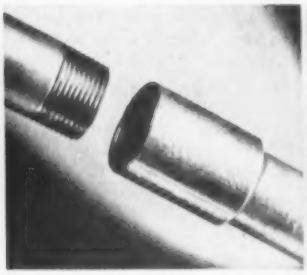
CORPORATION



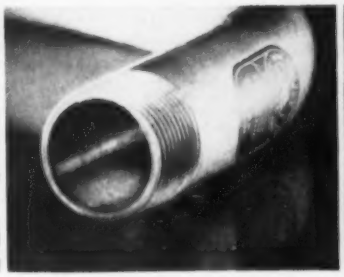
Check these six features before you buy another foot



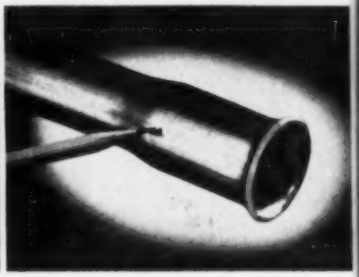
1. Galvanized threads won't rust. Clean and sharp galvanized threads make Rome rigid easy to install. These threads won't rust or corrode during storage, even if left outside. Rome's couplings are completely galvanized, too.



2. Perfect thread fits are assured. Only Rome rigid is cold-formed from hot-rolled sheet steel. This method provides more uniform diameters and wall thicknesses which, in turn, result in better fitting threads.



3. Smooth interior surface makes fishing easy. Each length of conduit is exposed to the zinc bath for exactly the same time at exactly the same temperature. The resulting smooth and uniform coating assures an easy-to-fish interior.



4. Coating resists flaking even under distortion. The adherence of zinc coating to Rome rigid is outstanding. Conduit goes directly from the inert atmosphere of reducing furnace into zinc bath without contacting oxygen or other corrosive elements.

Galvanized inside and out...and on the threads, too

Rome's new rigid conduit stays clean and ready to install— even when stored outside at job!

Rome's new galvanizing procedures assure you rigid conduit that's *ready to use when you need it*. Rome rigid is galvanized inside and out—and on the vital thread area, too—so your crews won't have to spend expensive time at the job site cleaning off rust and getting it ready to install.

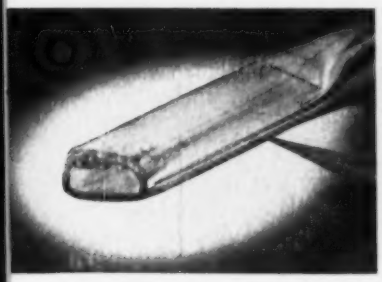
Made of hot-rolled, shot-blasted sheet steel instead of ordinary "skelp," Rome rigid is cold-formed. Wall thickness remains constant, and strength and surface quality is uniform. Electric resistance welding is used to provide added strength and safety. Inside and outside diameters are held to exacting tolerances, and threads are cut clean and sharp. Then Rome rigid is galvanized all over with the exclusive Sendzimir hot-dip process (patented by Armco).

Every single length is then inspected from end to end, and special *color-coded metal thread protectors* are applied. After this, they are bundled and made ready for shipment to your stock or job site.

These painstaking efforts are just a few of the reasons why Rome rigid is your best rigid conduit buy. Specify Rome rigid for your next job. And if you would like more information on this product, contact your nearby Rome Cable sales office—or write to Department 946, Rome Cable Corporation, Rome, New York. Ask for Bulletin C-1.

ROME CABLE
CORPORATION

of rigid conduit



5. Seam welds are the strongest of any rigid conduit. Rome rigid's weld is stronger than the conduit itself. It is the only conduit sealed by electric resistance welding—the method used to weld tubing for such high-pressure products as boiler and condenser tubes.

6. A complete line of Rome rigid is available. You can meet all conduit needs of your next job with Rome rigid. It and necessary couplings are available in sizes ½"—6"; conduit is available in 10-foot straight lengths and 90° elbows.

Western Sales Offices

SALT LAKE CITY 1, UTAH
230 South 4th West
(Tel. Elgin 9-8811)

SAN FRANCISCO 24, CALIF.
1100 Selby Street
(Tel. Valencia 6-3580)

LOS ANGELES 22, CALIF.
2510 South Malt Avenue
(Tel. Raymond 3-3631)

SEATTLE 4, WASHINGTON
3430 Fourth Avenue, So.
(Tel. Seneca 3017)

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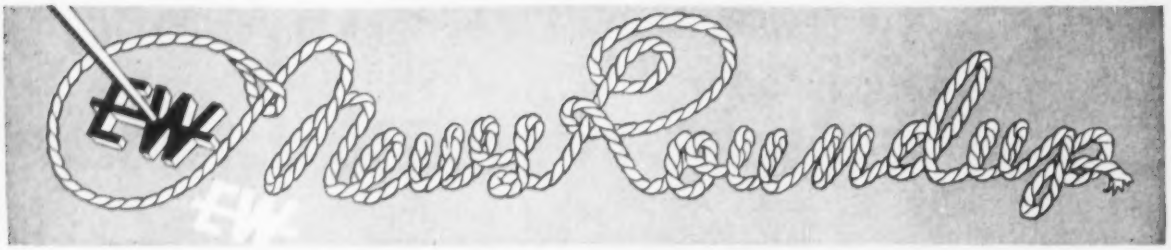
1160 Elati Street
(Tel. Keystone 4-0533)

PORTLAND 5, OREGON
1224 S.W. Morrison Street
(Tel. Capitol 2-5470)



SIGNIFICANT ITEMS FROM THE EDITOR'S NOTEBOOKS

ESCALATORS—First costs of atomic power plants seem to have been underestimated if current reports are true.

The Consolidated Edison Co. of New York now estimates the cost of its nuclear power plant to be $250 per kw, up nearly 13% over the original figure. Commonwealth Edison's atomic station also is reported to be costing more than originally planned due largely to added expense in the research and developmental phases of the construction.

Production costs of kwh from atomic stations still are in the somewhat controversial stage, although one estimate suggests that the atom can be expected to produce a kwh at just under 1c at the current state of the art.

—EW—

We are pleased to report that early flooding on the Snake River did not cause too much delay on Idaho Power's Brownlee project. The two cofferdams taken out by the flooding had already been cut down close to water level and remaining work was done just ahead of the rising water. There is more in This Month's News.

—EW—

ROLL CALL—You have heard of the National Hells Canyon Assn.? For some reason, possibly because of the big noise it makes and its success in delaying important hydroelectric projects, it is easy to picture a mighty host of citizens who believe in public ownership of power facilities.

A report by George Peck in *The American Way* changes the mental picture radically.

About a year ago, in March, 17 persons attended a national meeting of the association. A three-state convention in April 1956, including members from Idaho, Oregon and Washington, attracted 23. A three-state potluck dinner and planning meeting in February was attended by 36.

This is people's power?

—EW—

Be sure to try your skill in our Kilowatt-hour Load Forecasting Rodeo. Full details are in an announcement in this issue of ELECTRICAL WEST.

—EW—

MOUSETRAP—Tacoma City Light is pounding more sand into the rat hole. A $600,000 payment to Arundel-Dixon Co., contractor on Mayfield Dam, has been approved to bring total expenditures to $7,750,000 on a project that has undergone a fantastic amount of legal sniping and is currently suspended because of a supreme court decision.

A legislative bill that would permit construction to start again is, for the time being, just about as dead as it is possible for it to be. It is in the hands of the Washington House of Representatives fisheries committee.

Work is suspended because the supreme court has ruled that Tacoma has no right to condemn a hatchery and other state-owned property that would be inundated by construction of Mossyrock Dam. The city has sponsored legislation that would change this, and the bill squeaked through the Senate. Upon receiving the bill, the House referred it to the fisheries committee which is headed by Rep. Chet King, a supporter of the fishing industry.

—EW—

Ole Svensen told his boss: "It only cost me $15 to get an income tax refund of $7.13.

"That's cheaper than bail."

SLIDING SCALE—Engineering salaries at the Boeing Airplane Co. will be tied to new hiring salaries if the company accepts a proposal of the Seattle Professional Engineering Employees Assn.

Under the proposal, salaries of the newly hired engineers would be evaluated annually (after the recruiting of recent engineering graduates) and the same percentage increases in starting salaries over the previous year would be applied to the salaries of established engineers.

The association believes that the plan not only provides equitable salary levels but also might place the company in a much better position to meet competition for engineers in the free employment market.

—EW—

Vernon W. Ruskin of B. C. Engineering Co. Ltd. reports that gas-turbine plants are economically feasible at hydro stations to firm up the plant in areas where periodic water shortages can be expected. Ruskin recommends gas turbines because of their low first cost.

—EW—

OUR KIDS—M. S. Coover, president of the AIEE, said recently: "The gap between high school training and college entrance requirements in this country is acute and tragic.

"It seems incredible that we can think of continuing to have a well integrated educational system in America without taking immediate steps to reduce this gap." He continued, "We in America believe in local control in education. It can be made to work properly. Unfortunately, the school administrators in some communities, acting with good intention based on inadequate information, are yielding to pressure from those who would spare their children from the more rigorous courses in the sciences, have per-

new CAROL EXTENSION "CORDSETS"

for top performance • longer life

A SUBSIDIARY OF Penn-Texas CORPORATION

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NEMA

CAROL CABLE COMPANY
Division of The Crescent Company, Inc.
Pawtucket, Rhode Island

Available in both red and black, Carol Cordsets stand up under all working conditions, inside or out. Packaged in heavy-duty storage cartons that are clearly labeled and long-lasting.

Carol Cordsets come in a *complete* line of seven different lengths and in two gauge sizes to meet *every* demand. All attachments *molded on* for long life.

"Call the museum, Joe; I think we're uprating a real antique!"

Your General Electric Apparatus Service Shop can rebuild your old transformers like new. The shop can uprate your old transformers in both kva and voltage for about two-thirds the cost of new transformers . . . can also convert to self-protected type. And you get new-transformer warranties. Call your G-E Apparatus Service Shop or Sales Office. 431-56

Progress Is Our Most Important Product

GENERAL ELECTRIC

mitted the quality of those courses to decline or except for mathematics to disappear."

He charged: "As engineers and as parents and as citizens who are deeply concerned about the future of our nation, we need to evaluate trends in educational standards in our own communities very carefully."

—EW—

$16,000—If you are inclined to feel poor, the U. S. Chamber of Commerce can tell you why. It figures that the average family's share of the gross U. S. public and private debt is more than $16,000 — the whole amount totaling $1 trillion.

The only encouraging facet of this situation is the relation of the gross debt to gross national product which has shown no significant trend change since 1929. At an average of 5%, the interest charges on this debt would total nearly $50 billion annually.

If you don't think it costs money to keep up with the Joneses, look at your bank balance along about the 15th of this month after Uncle Sam has had his take.

—EW—

The Federal Power Commission has completed a study that shows that electric utility steam plants, large users of water, are among the least wasteful of water supplies of any industry in the country. Steam plants, according to the FPC finding, lose only two-tenths of a gallon of water per kwh by evaporation.

—EW—

Publishing deadlines are frustrating sometimes. For example, when the judging and photographing of Denver's annual residential Christmas lighting contest is underway, we are working on our February issue. So, Christmas lighting photos do not seem appropriate and we have to postpone showing them to you. We are most happy, however, to pass along a report from Ralph Hubbard, manager of the Rocky Mountain Electrical League, that Denver's entry in General Electric's national contest placed fourth. Sponsors of the Denver contest are RMEL, Denver Post and Denver Junior Chamber of Commerce.

PROTECTION — Engineers from the Southern California Edison Co. have reported that selective lightning application is justified on their system because of the low incidence of lightning in the southern California area.

The Edison company has 2,900 circuit miles of 220-kv and 3,000 circuit miles of 66-kv transmission lines connecting 200 stations in the southern California area. Based on 1,224 records, a station located in an isokeraunic level (storms per year) of 30 to 40 would have a 20,000-amp surge once in 300 years.

Based on this information, the California area with one-tenth of this incidence would expect a surge of 20,000 amp once in 3,000 years or a 10,000-amp surge once in 550 years.

—EW—

General Electric's switchgear department has announced a new motor-powered stored-energy operating mechanism for closing magnetic-type power circuit breakers in metal-clad switchgear. The new unit has the ability to operate directly from a low-power a-c source without need of rectifiers. The mechanism can be operated manually or from a lamp circuit or even a potential transformer in an emergency.

—EW—

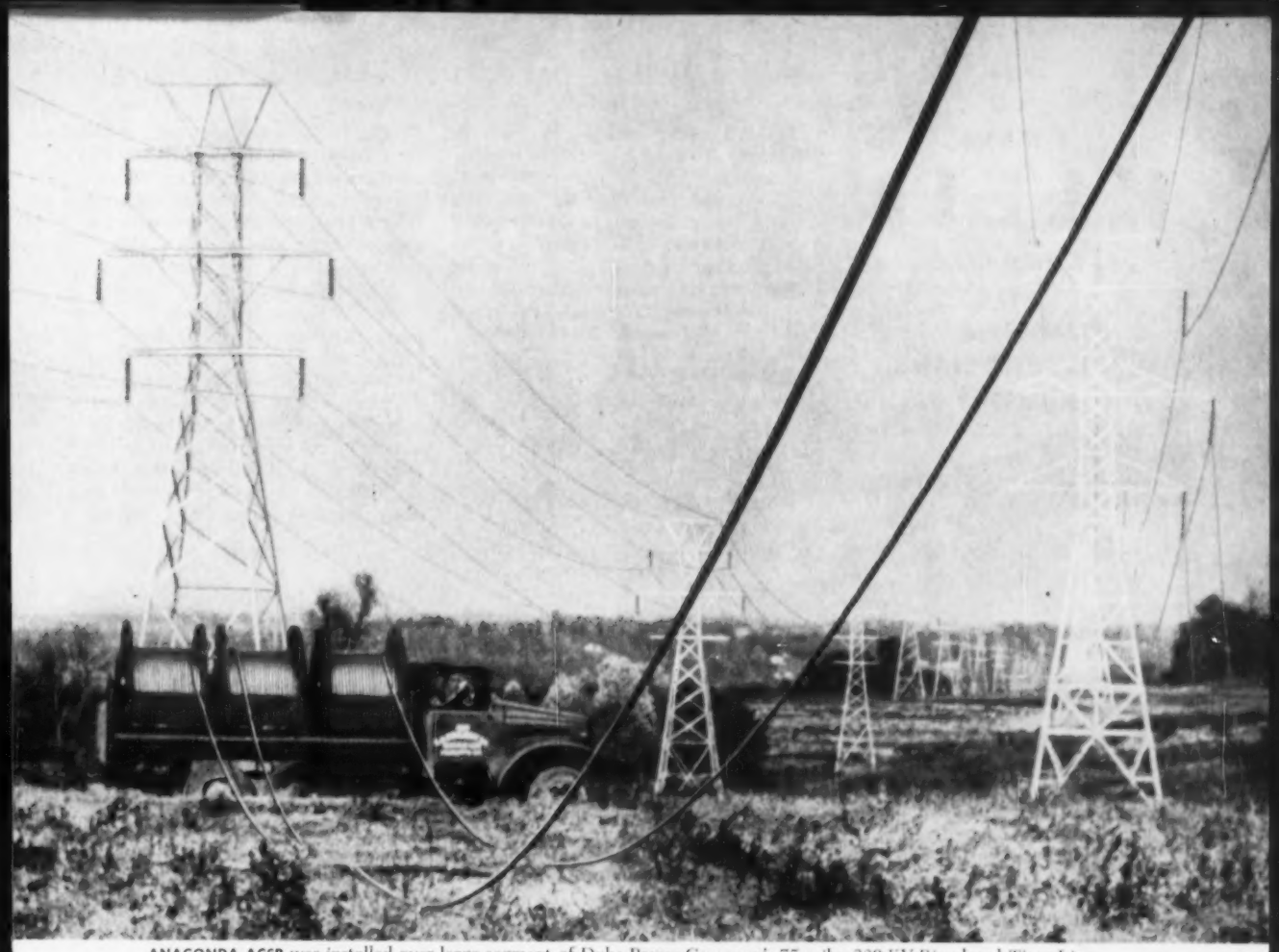
GOOD BUSINESS — The California Assembly and Senate have adopted a resolution that, in part, says:

". . . this legislature henceforth shall examine all proposed legislation relating to business, industry, and agriculture in terms of its effect upon the business climate of the state, and shall determine whether such legislation may have any future discriminating or deterring effect upon the investment of capital and the creation of needed pay rolls in California . . ."

In brief, the legislature has taken formal action to help attract more than $2-billion capital investment to the state each year. And the lawmakers have requested the administrative section, including the governor, to follow suit.

—EW—

THREE-DIMENSIONAL ENGINEER—Frederick R. Kappel, president of the AT&T, called businessmen's attention to the need for three-dimentional engineers, the first di-



ANACONDA ACSR was installed over large segment of Duke Power Company's 75-mile, 230 KV Riverbend-Tiger Line.

ACSR? Put Anaconda's 50 years of transmission cable experience to work for you

From the very finest engineered product . . . to superior workmanship . . . to on-the-job assistance . . . there is no one better prepared to serve you today with ACSR than Anaconda.

Producing top quality transmission cable requires more than a ready supply of metal—copper or aluminum. The most vital ingredient: the manufacturer's *cable experience*.

The choice of metals may change. But cable requirements and the skills and knowledge involved in making dependable transmisson lines do not. Whether copper or aluminum . . . it will pay you to call on the Man from Anaconda.

Backed by the broadest line of wire and cable in the industry, in both copper and aluminum, he is best qualified to help you arrive at the most practical and economical answer to your cable needs.

Multi-mill manufacturing facilities—strategically located across the country—assure speedy service. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

UNIQUE THREE-REEL TRUCK was used to install cable—795 Mcm, 26/7 ACSR from Anaconda. Three reels at once sped work.

FASTEST WESTERN SERVICE — At Orange, California, Anaconda's expanded, modernized mill fabricates and stocks copper and aluminum wire and cable for *every type of application*. Anaconda's Western Distributors thus can assure the fastest possible service on all West Coast needs. See Anaconda Sales Offices: Los Angeles, San Francisco, Seattle, Denver.

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for ALUMINUM WIRE & CABLE

NEW

KLEIN

CATALOG

FOR

- LINEMEN
- ELECTRICIANS
- INDUSTRY

100 years ago in 1857, Mathias Klein opened a little forge shop in Chicago. Out of this has grown the national institution known as Mathias Klein & Sons.

To dramatize this 100 years of service to industry, Klein has prepared a completely new catalog.

It contains illustrations and descriptions of the wide range of pliers, grips, climbers, belts, safety straps—the tools and equipment needed by linemen, electricians and industry.

A new feature is a section giving the dimensions of each plier—length of handle, length of cutting knives, width of head, size of point, etc.

This Klein Catalog No. 100 will be of interest to linemen—electricians—good workmen everywhere. A copy should be in the hands of every purchaser of good tools. Write for yours.

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Established 1857 Chicago, Ill. U.S.A.
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mension being college engineering training, followed by the second dimension which is the broadening that comes from training and self-study while in industry. The third and important dimension is the height that is attained by mingling engineering and management ideas so that the engineer's understanding of the problems and requirements of his business makes him more effective in that business.

Sounds great!

—EW—

Congratulations to Fluor Corp. on its impressive, artistic and candid annual report to stockholders. The Conrad Capune cover is colorful, photography is dramatic and the text is interesting and readable.

—EW—

NEW DIET—With America's railroads nearly completely dieselized the possibility now exists that commercial 60-cycle, single-phase current may play a key part in powering the locomotives of the future.

Recent developments in a-c single-phase motive-power systems, as well as improvements in the mercury arc rectifier, and the encouraging prospects that the semiconductor rectifier present, have convinced many traction engineers that railroad electrification is near.

PROUD — Somewhere, at one time or another, you have probably used or handled a radio, refrigerator or some other electrical or electronic device that contains Pamco components. These are made by Paraplegics Mfg. Co., 10068 Franklin Ave., Franklin Park, Ill.

As the name indicates, the company employs physically handicapped personnel, mostly war veterans. It is a profit-making, tax-paying business, and a credit to the electrical and electronic industries.

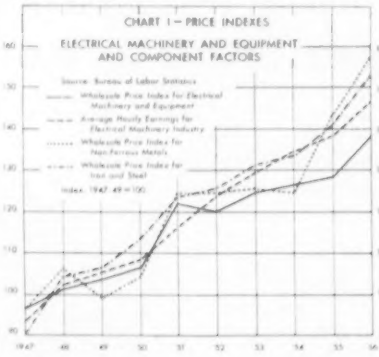
Our thanks go to President Dwight D. Guilfoil for sending us the illustrated booklet about his company and its worthy activity.

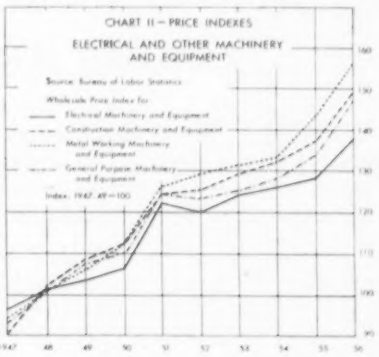
—EW—

DIVORCE? — Relations between Seattle City Light and the contractors on the Gorge High Dam project are shaky. The project is more than a year behind schedule, partly because the ice cofferdam is leaking and causing delays.

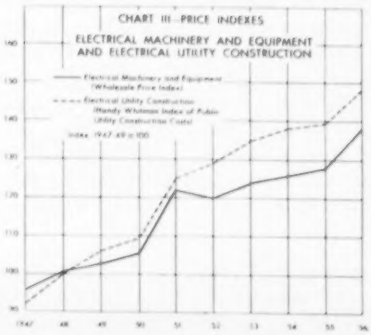
One report is that the city and Merritt-Chapman & Scott and the Savin Construction Corp. have agreed that the $15,000,000 construction contract should be terminated. But terms of termination have not been agreed on.

Another report is that Paul J. Raver, City Light superintendent, has asked for authority to deal directly with a subcontractor, Intru-





From information supplied by the Bureau of Labor Statistics, Westinghouse Electric Corp. has drawn up some revealing charts. The charts are self-explanatory to a certain point, but Westinghouse offers this further commentary: Chart I would indicate that, in view of rising costs, the electrical industry would be justified in further price increases; Chart II would indicate that other competitive industries already have found it necessary to do so; Chart III would indicate machinery increases were not a major factor in utility construction costs

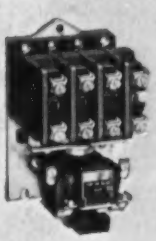


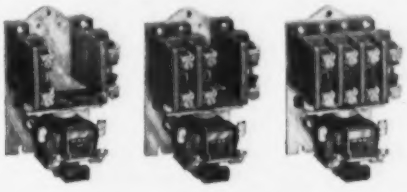
From 5 basic models you get 10 standard relays with the new CLARK Type "PM" Relay line

The 5 Basic Models

SECTIONAL POLE CONSTRUCTION—a new design concept for relays—provides units with 2 to 12 poles, with the greatest variety of combinations and pole arrangements available in an integrated 10-ampere line, and with a minimum of different parts to stock. Extra poles are available in kit form—assembled either normally open or closed. Coils and complete magnet assemblies are also available in kit form. Stocking of coils is simplified since one coil for a given voltage will handle any combination of 2, 3 or 4 poles normally open or closed, and for larger relays is correspondingly simple.

No. 5U-4
Basic
4-Pole

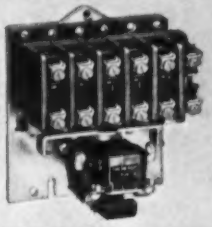


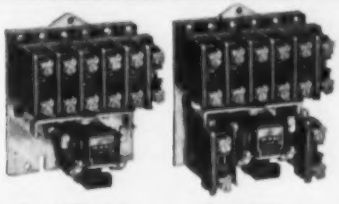


2-POLE 3-POLE 4-POLE

By removing one or two poles, the standard 4-pole unit becomes a 2 or 3-pole relay.

No. 5U-6
Basic
6-Pole

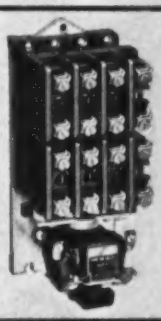


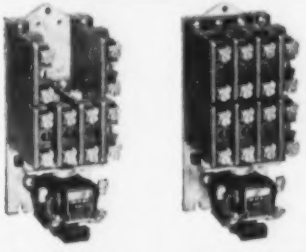


6-POLE 8-POLE

By adding 2 poles next to magnet, the standard 6-pole relay becomes an 8-pole unit *—the first 8-pole relay available for single deck wiring.*

No. 5UK-8
Basic
8-Pole

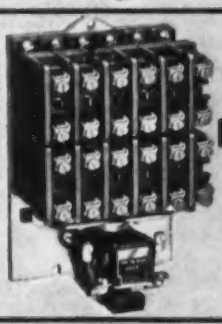


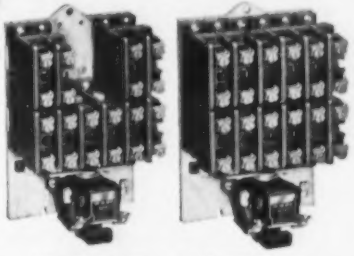


6-POLE Double-decked 8-POLE Double-decked

By removing 2 poles from the double-decked 8-pole relay you get an alternate 6-pole of double-deck construction.

No. 5U-12
Basic
12-Pole





10-POLE 12-POLE

With 2 poles removed, the 12-pole unit becomes the standard 10-pole relay. Both have identical mounting dimensions with NEMA standard size 1 starters.

No. 5UK-2
2-Pole

2-POLE "SPACE SAVER"—a special purpose relay designed exclusively to meet small or unusual space requirements. Overall height less than 3 inches.

Write for 8-page illustrated Bulletin PL-7305 for complete information on this revolutionary new line of heavy-duty relays. Or contact your nearest Clark Distributor.

The CLARK CONTROLLER Company

Everything Under Control

1146 East 152nd Street • • Cleveland 10, Ohio

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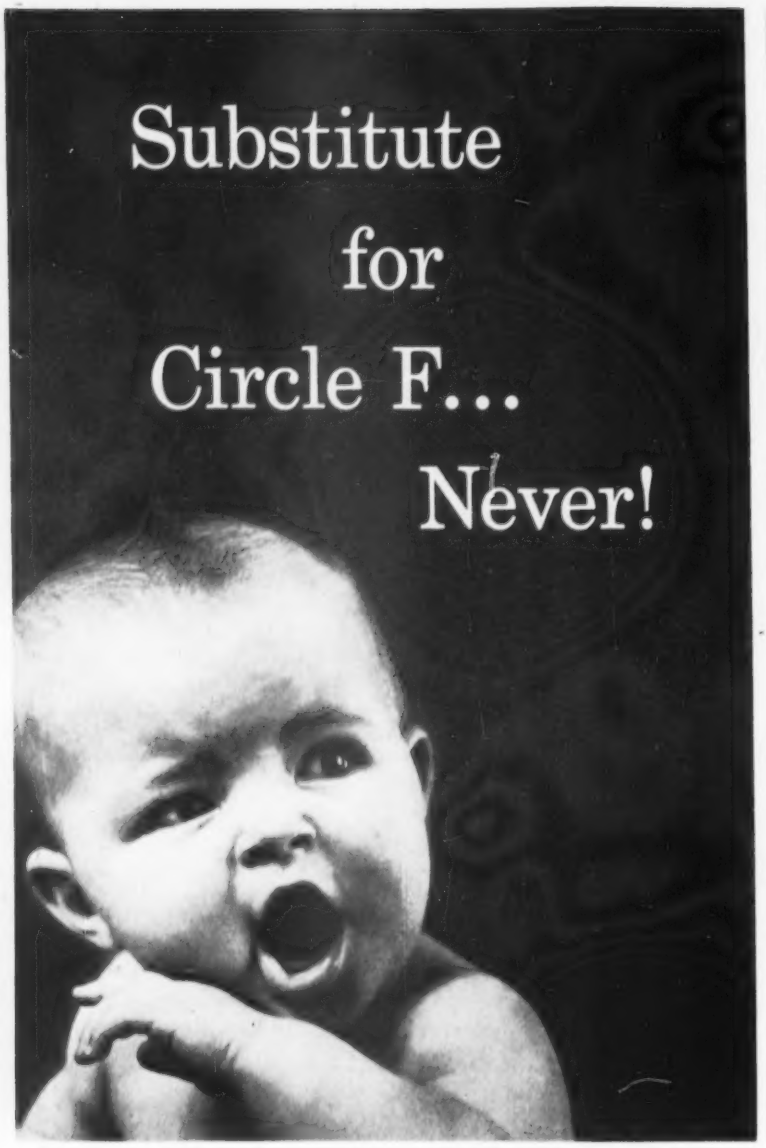


Look no further for wiring devices! Because with Circle F you've never had it so good... in quality and service... and in price, too!

No. 3401
No-KLIK
QUIET
SWITCH

No. 2524
N.E.M.A.
GROUNDING

No. 2515
N.E.M.A.
GROUNDING

Circle F Mfg. Co.
TRENTON 4, NEW JERSEY

For your wire requirements: Eastern Insulated Wire Corp.
Box 591, Trenton, N. J.
A Subsidiary

sion-Prepakt, for injection of grout to stop the leakage. What effect this would have on the prime contract is not reported.

At any rate, with Bethlehem Steel coming on to Seattle lines with two electric furnaces requiring about 40,000 kw next year, the city is looking for a quick way to beef up the supply without cranking up a steam plant.

—EW—

DIFFERENT—Just about the time you are reading this, Public Service Co. of Colorado will begin taking its Denver customers to airfields, skid row, locker rooms at halftime, the Museum of Natural History and various and sundry other places—via television.

The company is starting sponsorship of an unusual local TV program called "Panorama" which will give viewers a close-up of newsworthy and interesting events and places. Telecasts will be live and varied, and the company expects it to attract a large local audience.

Narrator on the program is Gene Amole, a popular radio and television personality, who conceived the show.

Arizona Public Service employees have "trained" their Univac to sing songs. We would like to be on hand to see the fuses blow when they run an Elvis Presley number through it.

—EW—

NEW NAME – What you have known as the Seattle District, Corps of Engineers, is now the U. S. Army Engineer District, Seattle, Corps of Engineers.

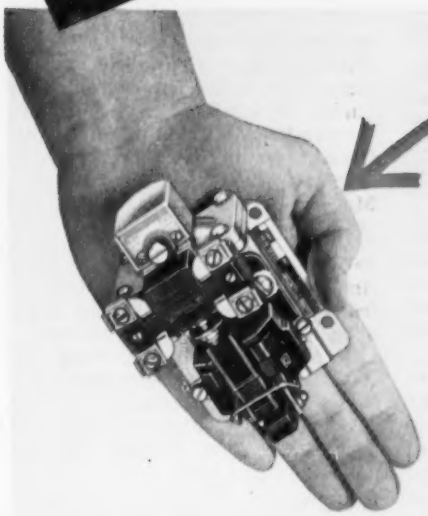
The next higher office, in Portland, is officially the U. S. Army Engineer Division, North Pacific, Corps of Engineers.

Let's see now, the initials in a headline would be USAEDSCOE for the first and USAEDNPCOE for the second. We think Gil Bean, the technical liaison officer, will understand if we stick to the old names.

—EW—

Great Britain has set a new goal of 5-6,000,000 kw of atomic power electricity by 1965. This is just three times the amount originally set for the same year. About 19 generating stations will be producing the power.

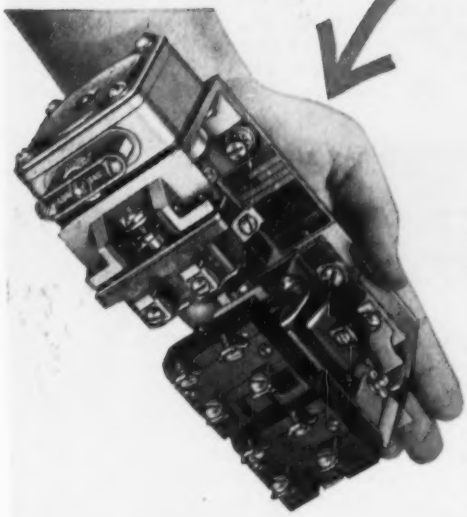
What's Your Timing Problem?—ONE OF THESE TIMERS WILL DO YOUR JOB *Exactly!*



NEW...Type A

REALLY SMALL IN SIZE AND COST!

for applications requiring shorter timing periods, ±15% accuracy and no interlocks



Type B

MACHINE TOOL STANDARD FOR MORE THAN 20 YEARS!

for applications requiring timing periods up to 3 minutes, maximum accuracy and 1 or 2 instantaneous interlocks

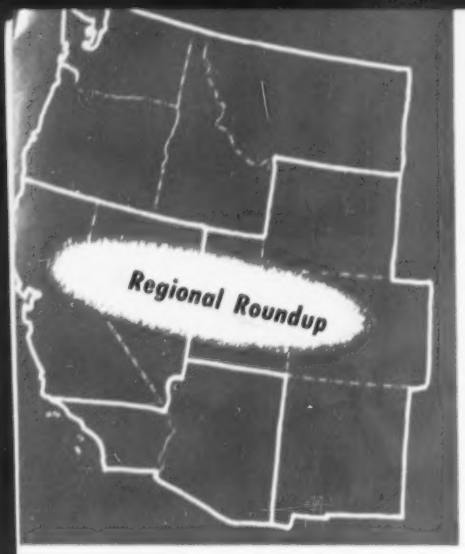
COMPARISON	TYPE A	TYPE B
Timing Period	.2 to 1 min.	.2 to 3 min.
Accuracy	±15%	±10%
Interlocks	None	Max. 2 Double Circuit
Panel Space	2⅜" x 4"	2½" x 7⅜"
Convertible Delay-On • Delay-Off	Yes	Yes
Maximum Voltage AC—DC	600 V. AC only	600 V. AC 250 V. DC

Write for Timer Bulletin 9050

Address Square D Company, 4335 Valley Boulevard, Los Angeles 32, Calif.

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE

SQUARE D COMPANY



Pacific Northwest Region

A QUICK review of the status of some of the area's hydro projects indicate substantial progress despite winter snows and early spring floods. Idaho Power's Brownlee on the Snake is one-third complete, according to R. F. Ball, assistant to the president. About 1,000 men are working, many of them with families living in trailer camps and a few permanent houses at Brownlee and Oxbow 12 miles downstream. First of the generating units will go on the line early in the summer of 1958, and the total of 360,400 kw in the first stage will be installed by November of that year.

Karl Strenge, chief civil engineer for Washington Water Power, reports the company's $84,000,000 Noxon project on Clark Fork is one-fourth complete. New contracts for bridge building and rail and highway relocation have recently been let in preparation for filling the 38-mile reservoir behind the dam early in 1959. The first of four 100,000-kw units will go on in the fall of that year.

Pelton Dam of Portland General Electric Co. is taking shape in the Deschutes River canyon. Concrete pouring, which started last fall, has been carried on through the winter in the arch dam and the power house, covering three 16-ft penstocks. The company has commenced laying out and improving Pelton Park along the lake site to be a public recreation area.

Work has also commenced on the north fork of the Clackamas to increase the capacity of PGE's Faraday plant. Larry J. Kelsh has been appointed resident engineer on this project. He formerly had this position at Pelton, and his place there has been taken by Donald J. Brochl, from the engineering department in Portland.

A brand new start was made in February on Baker River in Washington by Puget Sound Power & Light Co., and by the end of the month 660 men were in camp, clearing, road building and excavating for the Upper Baker project. This development will yield 85,000 kw at the upper Baker site and 55,000 additional at the existing Baker River plant downstream

Pacific Power & Light dug through deep snows at the Swift site on the upper Lewis River to build access roads to the site of the cofferdam. At the other end of its territory, in Coos Bay, exploratory work was continued on Eden Ridge. Preliminary permit has been issued, and the company is testing core samples of the bituminous coal to be the fuel supply of the combination hydrosteam plant estimated to bring 270,000 kw to bolster the power supply of this important industrial area in the southwest corner of the company's system.

And last but not least, at time of writing (March 10) the U. S. Corps of Engineers closed the power house gates at The Dalles Dam on the Columbia, and began to fill the reservoir upstream, flooding the Celilo canal, the Indian fishing rocks at Celilo rapids, and backing the lake level up to the John Day River.

► Grover Fanning, district manager of G-E insulator department in Portland, has just recently returned to this job after an absence of about one year. In his absence, A. R. Barnes filled the position with the insulator department. Barnes has now gone to G-E Supply Co., San Jose.

► Lord Electric Co. of New York, Philadelphia and Boston has given recognition to the importance of the Pacific Northwest by electing its Portland manager, William R. McCabe, a vice-president. Lord came to Portland five years ago and sent McCabe in as manager some two years later.

► The Electrical Manufacturers' Assn. of Victoria entertained guests from Honolulu and Toronto, Canada, who were Pacific Northwest visitors. Harry Field of Hawaiian Electric Co. was on the program and discussed similar meetings held in Hawaii. The Canadian visitor was Jack Wilson of Wilson Electric, Toronto.

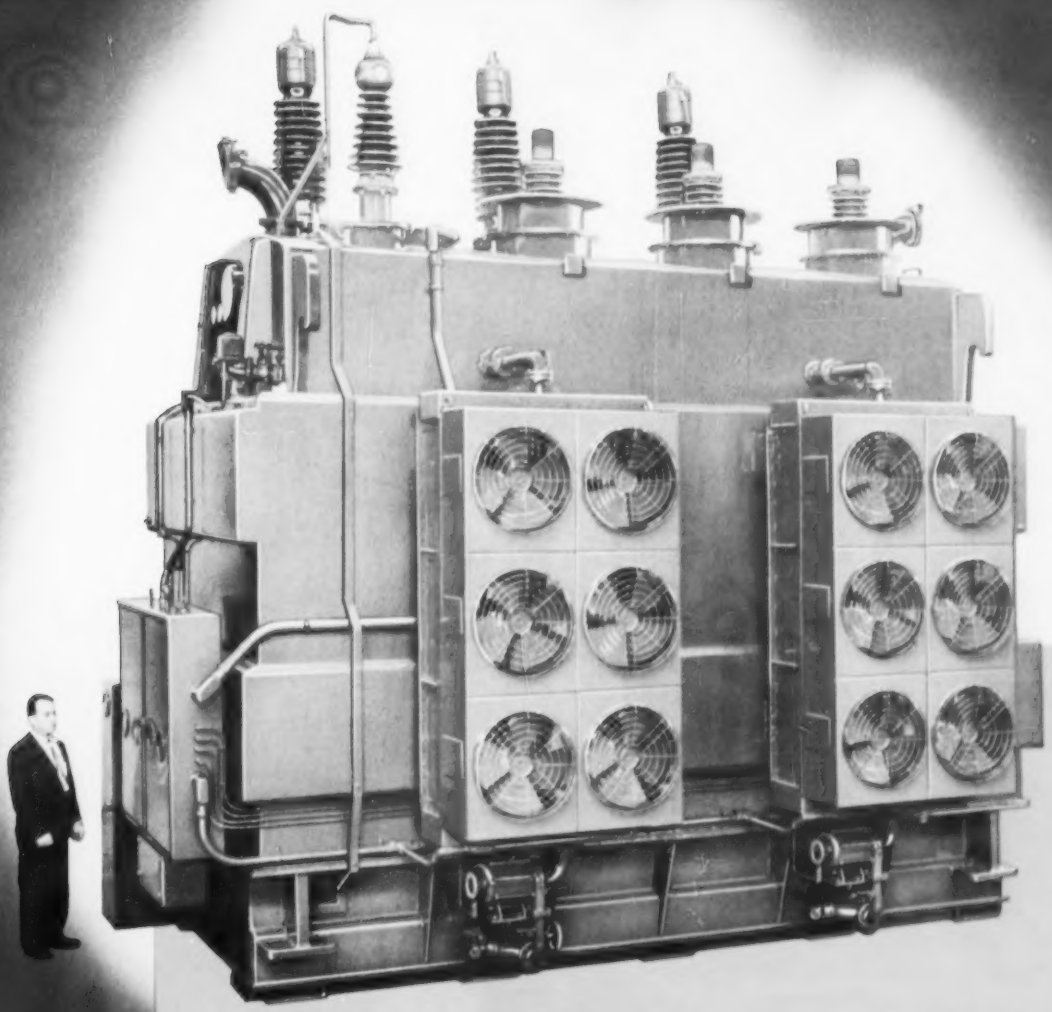
► "It isn't so much what you get as the means by which you get it," commented Carrol Brissenden, general sales manager of Portland General Electric, about winning the Electri-Living award, and a glance at the photo indicates what he means. Edith Evans, personable edi-

Carrol Brissendon receives congratulations of Edith B. Evans after receiving award

175,000 Kva

Three Phase CONTOUR DESIGN

Pennsylvania Power Transformer



Here is a main step-up generating station transformer supplied by Pennsylvania to a large Southern utility. It steps up a generated voltage of 17,500 volts to a transmission voltage of 115,500 volts. The small physical size of this large-capacity transformer is due to Pennsylvania's compact, shell form Contour Design, which enabled Pennsylvania to ship the transformer in an upright position, completely assembled except for bushings and coolers. Four Seal-Master pumps — exclusive with Pennsylvania — circulate the 8000 gallons of oil through two banks of heat exchangers. Overall height of the transformer is only twenty feet.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division

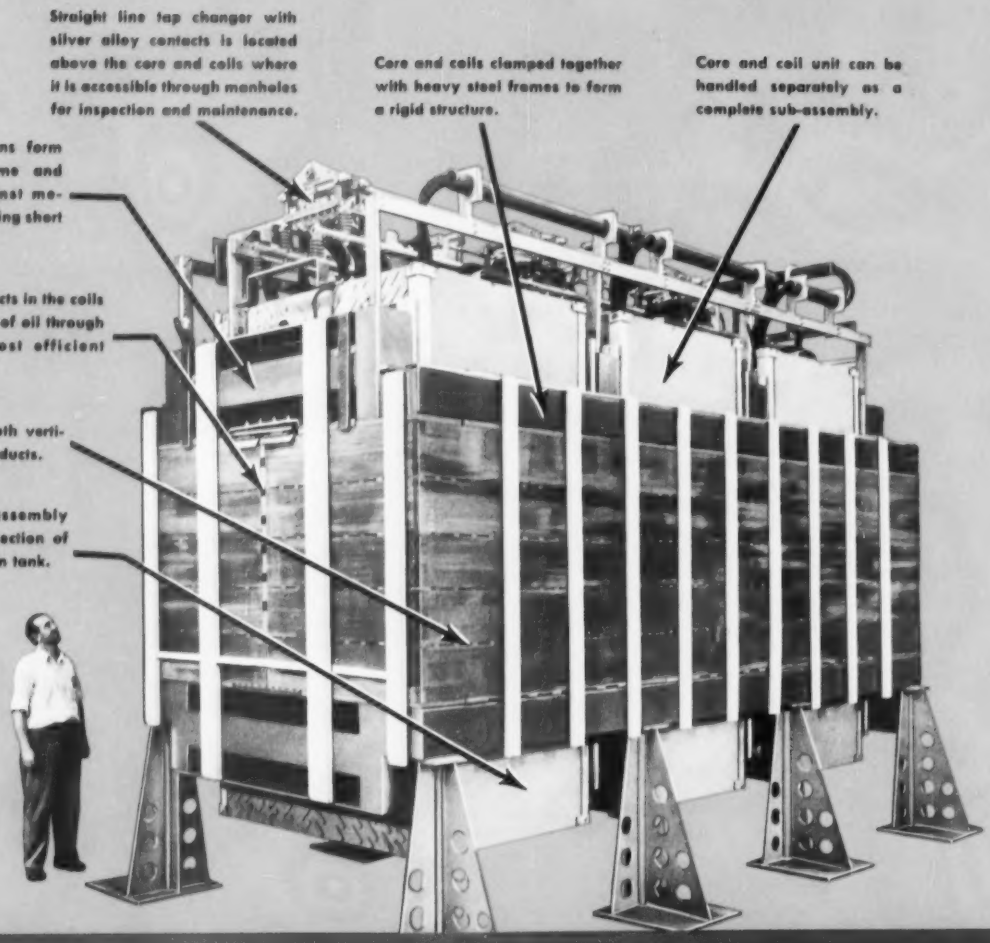
CANONSBURG, PENNSYLVANIA • ***Greater Pittsburgh District***

• • • • • SEE NEXT PAGE FOR INSIDE STORY • • • • •

Inside a

175,000 Kva THREE PHASE contour design

Pennsylvania Power Transformer


Straight line tap changer with silver alloy contacts is located above the core and coils where it is accessible through manholes for inspection and maintenance.
Core and coils clamped together with heavy steel frames to form a rigid structure.
Core and coil unit can be handled separately as a complete sub-assembly.
Heavy box sections form part of core frame and clamp coils against mechanical forces during short circuits.
Vertical cooling ducts in the coils permit a free flow of oil through the coils for most efficient cooling.
Core cooled by both vertical and horizontal ducts.
Core and coil assembly rests on bottom section of the Contour Design tank.

175,000 Kva, 3 Phase, 60 Cycles, 55°C. Temperature Rise.
Forced-oil, forced-air-cooled. High voltage: 115,500 Grd. Y volts.
Low voltage: 17,500Δ volts.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division

CANONSBURG, PENNSYLVANIA • ***Greater Pittsburgh District***

• • • • • *For exterior view of this transformer, see other side.* • • • •

tor-in-chief of *Living for Young Homemakers* magazine, presented the plaque with a firm handclasp of congratulations in Chicago recently. The company had won a nation-wide competition for building the best home of 23 entries in the contest sponsored by the magazine. Brissenden gives credit to his men Bill Tait, Nick Mason and Rollie Gabel for watching every move the builders made before they made it to see that the job fit perfectly with electrical living. Mel Sorenson of Kilowatt Electric Co. installed the wiring from the 400-amp service to the last clock outlet. Jack C. Nunn of Portland, the builder, won a trip to Europe in the contest. Ah, Paris in the spring!

Northern California Region

FROM WASHINGTON, D. C., and West Orange, N. J., come interesting reports on activities of L. Harold Anderson, vice-president and assistant general manager of Pacific Gas and Electric Co., and Mrs. Anderson, who visited the two cities in February.

Pete is Grand Master of the Free and Accepted Masons of California and Hawaii, and attended Masonic meetings in the nation's capitol. On a side junket on the invitation of George E. Stringfellow of Thomas A. Edison Industries, he visited Glenmont, the recently dedicated national monument that was once the home of Thomas A. Edison.

► San Francisco friends of Robert L. Kempton will be interested to know that he has been promoted to general sales manager of Edwards Co. Bob established the Edwards district sales office here in 1951 and was appointed assistant sales manager at Norwalk in 1954. In 1955 he was made assistant general sales manager.

► One way to learn of the accomplishments of our local electrical industry folks is to have them be elected president of the Electric Club of San Francisco. This column carried last month the report that John C. Beckett is new president of the organization. Since that time, at the inauguration hi-jinks to be specific, it was made public that he has really covered a lot of ground —and water.

Beckett is one of the 100 young men selected by the San Francisco Chamber of Commerce and *Time* magazine in 1954 as most likely to make news in future years. He has served on the Rapid Transit Commission since 1952 and is now secretary. Last year he was nominated "Engineer of the Year" by the American Institute of Electrical Engineers.

Three degrees from Stanford University, Navy service during World War II, research on the biological effects of atmospheric ions (he presented a paper on the subject in Paris in 1956).

► Bill Poynter, district manager of Federal Pacific's Pacific Switchgear Division, has found out how to keep up to date on new developments in industry. He teaches either sales engineering or technical communications at the University of California extension division one night a week.

► Another Federal Pacific employee gains mention in these columns this month. Don Mills has been named manager of development engineering for the Eastern Switchgear Division. He has been senior design engineer on magnetic air circuit breakers here.

► E. B. "Brownie" Neff, president of Erico Products, Cleveland, Ohio, was a March visitor in San Francisco. He was guest of Ken Ryals at an Electric Club meeting. Ryals represents Erico here on sales of the Cadwell process.

► Bob Scott of Wesix brought Bill Newman of Washington Water Power's residential and commercial heating department to a meeting in March. Bill was vacationing here, which places the visit in the category of busman's holiday.

► Another San Francisco visitor was Frank Nolan, an application engineer with Allis-Chalmers' switchgear division, who was on the program of a meeting of the Association of Iron & Steel Engineers. His topic was "Distribution System Studies in Steel Mills." He came to Electric Club with Sam Durand, regional electrical engineer for Allis-Chalmers.

► More visitors in San Francisco, this time from Chicago, were Bill Harvey and E. A. Armstrong of General Motor's Electromotive Division.

Intermountain Region

COLORADO Farm Power Council is stepping up activities with the hiring of its first full-time employee, Mrs. Margaret Reynolds. Active in council affairs for several years, Mrs. Reynolds has been associated with Mountain View Electric Assn., Limon, Colo.

Directors voted the employment of a full-time executive after reports at the annual meeting showed some council programs suffered from lack of personnel with time to carry through on details.

► The Graybar Electric appliance sales manager at Denver the past 10 years, H. J. Van Westenberg, has been promoted to supply sales manager. T. J. McBride was appointed to succeed Van Westenberg. D. M. Hitchcock, Graybar regional manager, reports sales at the newly opened branch at Colorado Springs "are up to our ambitious expectations." J. D. Travis is sales manager of the new branch.

► L. J. Robidoux, president of Consolidated Parts Inc. of Colorado, reports reorganization and expansion of his firm, formerly National Parts Distributors Inc. of Colorado. Robidoux said a West Coast branch has been opened at 581 E. Taylor St., San Jose, Calif., with Larry Labarere as manager.

Robidoux said James Dawson had been appointed sales representative to travel the Rocky Mountain area from the Canadian to Mexican borders. Clay Meeks and James Harris were added to the Denver sales staff.

► A new administration building at Denver for Colorado Employment Service, a state agency, features an outstanding lighting system. C. D. Belt, local representative for Day-Brite Lighting Co., said the new layout is the first of its type in the region.

Wiring is arranged on 4 x 4-ft modules so that lighting fixtures can be shifted parallel to each other or at right angles to meet varying demands. Partitions are movable to provide flexibility in the structure. The lighting system, installed by Sturgeon Electric Co., has been en-

gineered to meet any changes in partitioning.

Belt said the fluorescent fixtures have special plastic bottoms designed to provide the same lighting as Skytex glass, without its weight.

► William R. O'Rourke has been appointed acting manager of the Colorado Rural Electric Assn., pending the selection of a permanent successor to H. Vance Austin. He resigned after eight years in the Colorado REA position to become managing director of Credit Union National Assn., Milwaukee. O'Rourke has been public relations consultant to the REA group for the past five years.

► The latest products and developments by Sylvania were explained at meetings conducted in Albuquerque, Salt Lake City and Denver by top regional officials, Ted Sargent of Salem, Mass., manager of fluorescent commercial engineering, and Dick Smart of Chicago, regional engineer. Rocky Mountain area officials for Sylvania participating were Carl Long, regional manager; Dick Wintin, field representative for lamps; and Duane Little, field representative for fixtures.

Contractors, architects, engineers and others directly concerned with lighting installations attended the meetings.

Reflecting Sylvania's growing interest in the Rockies, a conference in retail merchandising for a half-hundred Sylvania officials from throughout the country was held at Evergreen, Colo., in mid-March. Sylvania leaders in attendance included H. L. Schreiner, W. L. Friend and F. H. Heintz.

Pacific Southwest Region

HONORS were bestowed recently on two Los Angeles members of the electrical industry by the AIEE. Ed Morris, Westinghouse Electric Corp. district engineering and service manager in Los Angeles, was nominated a director of the institute at the winter general meeting in New York, and William S. Peterson, general manager and chief engineer of the Department of Water & Power was selected "Electrical Engineer of the Year" by the executive committee of the Los Angeles Section. Both men are Fellows of the Institute, and have been active in AIEE activities for many years. Peterson, as current president of the American Public Power Assn., presented the keynote address at the association's Engineering and Operations Workshop at Springfield, Mo., on Feb. 14.

► Earl Condon, manufacturing representative for the Wire & Cable Division of U. S. Rubber Co. for the past 17 years, will continue to serve southern California in the same capacity for the division's new owners, Kaiser Aluminum & Chemical Corp. Purchase of the division by Kaiser became effective Feb. 1.

► The Western Air Conditioning Industries Assn. will hold what it believes to be the first regional (11 Western states and Texas) exhibit and educational conference for the air conditioning and allied industries in Los Angeles Shrine Exposition Hall on May 4 through 8. The show, to be called the Western Air Conditioning, Heating, Ventilating and Refrigeration Exhibit and Conference, will feature panel sessions on the most efficient use of the new equipment, proper installation and the potential financial benefits of the new equipment to hotels, restaurants and other business concerns. Products and services of manufacturers and distributors will be on display over the five-day period. Sponsors of the conference have also announced formation of an air conditioning research foundation to carry out educational and research programs of interest to the industry.

► Southern California Edison's president, Harold Quinton, presented employees of the company's Big Creek-San Joaquin River hydroelectric development with a bronze plaque for their role in setting a new high in production at the development in 1956. The project's seven power houses transmitted a record-breaking 4,073,147,003 kwh during the year. Roy Cowden, superintendent of the northern hydro division, accepted the plaque on behalf of employees at the company's annual management meeting in Visalia on Feb. 27.

► H. E. Easterbrook, manufacturing representative for the Allen-Bradley Co. of Milwaukee, and his wife left Los Angeles on March 15 for a five-week trip to Honolulu. The couple was accompanied by A. J. Benner, assistant to the president of Allen-Bradley Co., and Mrs. Benner. The two men plan to visit the company's distributors in the islands during the stay.

► The Electric Club celebrated its 36th birthday March 11 with a luncheon in the Biltmore Hotel in Los Angeles. Marion Bacot, executive secretary of the club, reports 29 charter membership certificates were presented to members who have been with the organization since its inception in 1921.

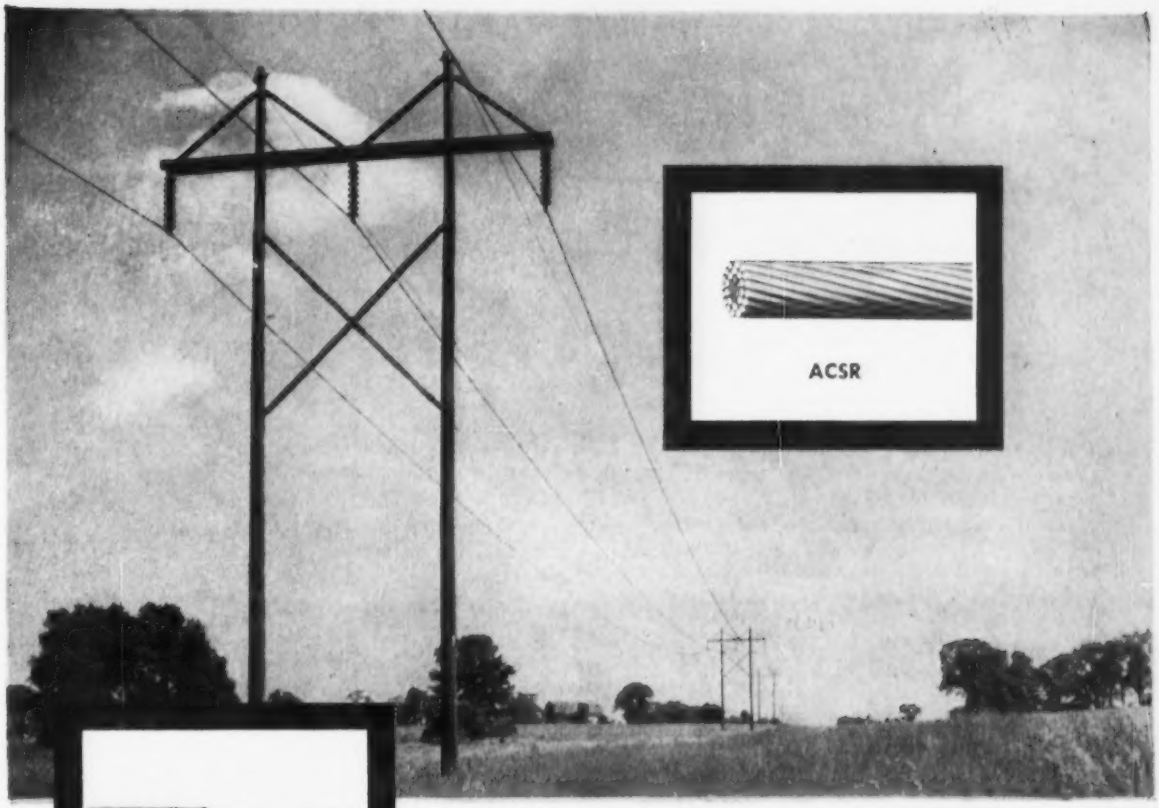
► The Electric League installed Edward G. Marten, local manager of Westinghouse Electric Co., as president on Feb. 16 at the association's annual banquet-meeting at the Hollywood-Roosevelt Hotel.

► New sales manager in the southern California Pacific Coast Division for Benjamin Electric Mfg. Co. of Des Plaines, Ill., is James Kersbergen.

► Both a new sales promotion and a national sales meeting are on the agenda of activities for Day-Brite Lighting Inc. of California, according to M. A. Cabot, Western sales manager. Day-Brite will begin a special "Let's Go Places" promotion for Graybar Electric Co. at the end of May. Award: a choice of trip to Hawaii, Bermuda, etc. April 22-25 will find Cabot and other members of the firm attending the national sales meet at French Lick, Ind. Special features of the event will be a new products display, and a series of conferences with the theme "quality selling in a competitive market."

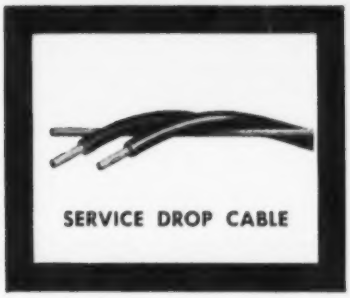
► Si Stern is now sales manager for the southern Calfiornia area for Rutkin Electric Co. Stern, a member of the firm for the past 12 years, formerly served as a sales representative.

Retiring president of the Electrical Maintenance Engineers Assn. of Southern California, Carl L. Ladenberger, passes the gavel to Charles H. Hays.



GENERAL CABLE

ALECTRAL ALUMINUM CONDUCTORS



Consistent, outstanding performance mark General Cable's ALECTRAL Bare and Insulated aluminum conductors. Manufactured to General Cable's high standards in all sizes. Bare ACSR and aluminum • Weatherproof aluminum and ACSR conductors • All types of service drop cables. ALECTRAL is available with a complete range of paper, rubber and thermoplastic insulations, backed up by over 75 years of General Cable's engineering and manufacturing experience.

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An example of Allis-Chalmers leadership

They Whisper While They Work!

These two 100,000-kva Allis-Chalmers transformers are good neighbors... thanks to careful pre-planning.

Installed in the middle of a residential area, these two large transformers could have created a public relations headache.

They didn't . . . because of elaborate planning by the utility's engineers working together with A-C.

In fact, this installation is a model of what can be done.

Before any designing was started, Allis-Chalmers mobile sound laboratory equipment was brought in. Day and nighttime studies of ambient characteristics indicated that the most economical solution to the problem required a twofold attack.

1. Design and build a low noise level transformer unit with frequencies melded to the ambient.

2. Build a masonry barrier around the transformers to reduce the noise level further.

So critical were the conditions that neither step by itself would do the job.

Today, the transformers are in full operation . . . and there are no complaints from the neighbors.

Transformers like this are an outgrowth of continued research by Allis-Chalmers into magnetostriction and resonance in A-C sound laboratories, acoustical proving ground and mobile research unit.

* * *

For help in finding the best and most economical means for solving sound problems, contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

This was the area with residences as close as 170 feet from the proposed transformer locations.

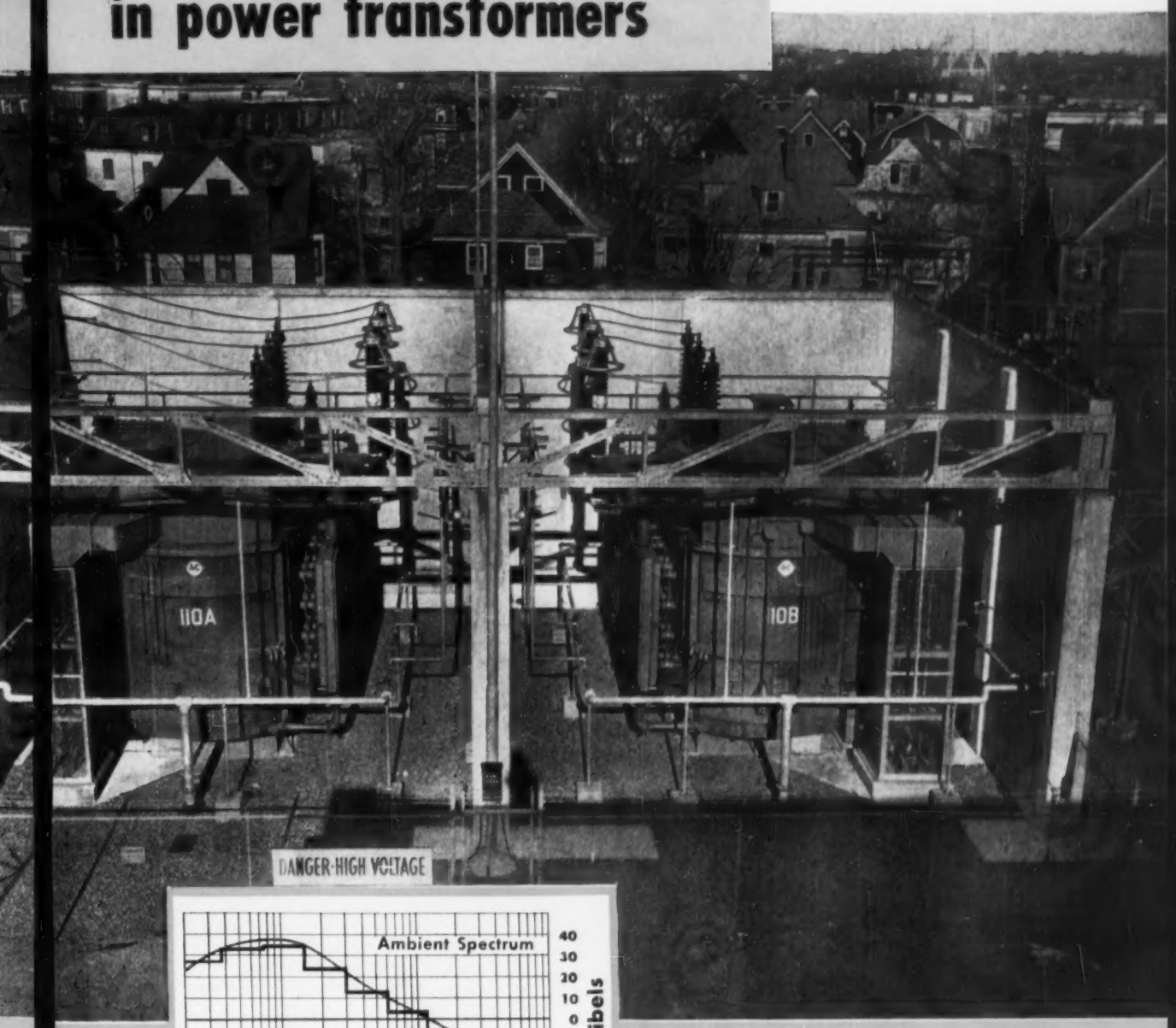
Mobile sound testing equipment was brought in to study ambient characteristics and find a noise level that would not be objectionable.

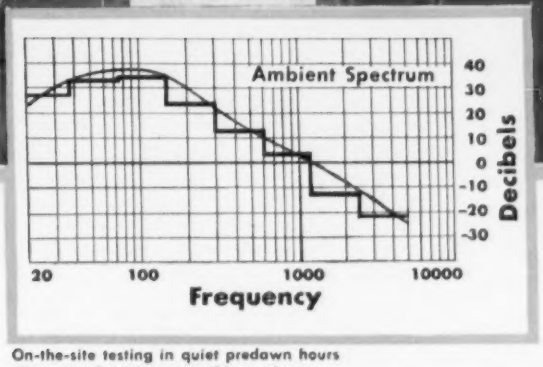
A-C ALLIS-CHALMERS

ALLIS-

A-5353

in power transformers





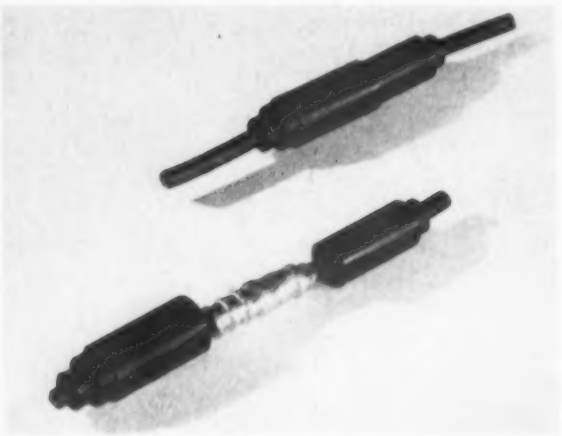
On-the-site testing in quiet predawn hours determined minimum masking noises.

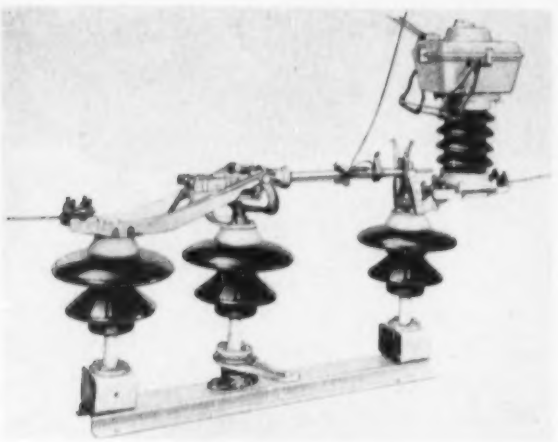
Transformer noise level lower than standard and use of masonry barriers were dictated by the severe requirements of the neighborhood.

CHALMERS

PRODUCT NEWS

New Designs and Applications





Splice Cover

(1) *Plastic Engineering & Sales Corp., 2628 St. Louis Ave., Fort Worth, Texas.*

A two-piece fitting that provides a moistureproof covering for electrical wire splices has been developed by this company. The cover is comprised of two tubular sections that slide together to form an overlapping seal. It is reported that no taping or further sealing is necessary. Can be separated and reused.

Straight-Line Clamps

(2) *Brewer Titchener Corp., Hi-Line Div., Cortland, N. Y.*

This company has introduced a complete line of straight-line clamps for distribution, light transmission and substation use on all conductors. The clamps are drop forged from both steel and aluminum. Three sizes are in the series, each available with or without socket adapters. Rated strength is reported to be 15,000 lb for steel clamps; 12,000 lb for aluminum clamps. Steel parts are galvanized.

Belt Supporter

(3) *Mathias Klein & Sons, 7200 McCormick Road, Chicago, Ill.*

Four-point suspension with four separate straps is a feature of this new safety belt supporter. Each strap has buckle adjustment. Available in sizes 36 to 46.

Burnisher

(4) *Adve Co., 8980 Hawthorne Lane, Hales Corners, Wis.*

A new 3-in. burnisher with a plastic handle is offered by this company. It is designed for use where relay contacts are hard to reach, and is an accessory for a pen-type contact burnisher. Recent improvements in the basic unit include a longer element and a spare 1½-in. blade.

Oil Interrupter

(5) *Line Material Industries, 700 W. Michigan St., Milwaukee 1, Wis.*

A 600-amp oil interrupter, to be mounted on new or existing vertical break air switches, is announced by this company. It is an accessory to type PV horizontal mounted switches rated at either 23 kv or 34.5 kv. Said to be capable of interrupting or picking up load currents equal to the full continuous current rating of 600 amp.

Aerosol Degreaser

(6) *Stewart-Hall Chemical Corp., Corp., Box 66, Fleetwood Station, Mt. Vernon, N. Y.*

This new canned spray is reported to aid removal of grease, oil, carbon, tar, gums and other substances. It is said to be usable on electrical equipment, leaving no film or vapor. Does not contain carbon tetrachloride.

Vaportight Fixtures

(7) *Crouse-Hinds Co., Wolf and 7th North Sts., Syracuse, N. Y.*

An all-in-one aluminum unit that combines the socket, globe holder and guard is a feature of this new vaportight lighting fixture. Cleaning and relamping is accomplished either by releasing a retaining spring and removing the globe or by removing the entire assembly from the condulet body without disturbing the wiring.

Conduit Bender

(8) *National Electric Products Co., Gateway Center, Pittsburgh, Pa.*

This company announces a new one-piece hand tool for bending 1-in. rigid steel conduit and 1¼-in. metallic tubing. A booster step device aids with bending. The same groove serves for bending both rigid conduit or metallic tubing.

White Mercury Lamps

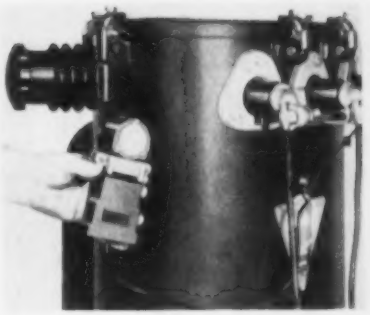
(9) *General Electric Co., Large Lamp Department, Nela Park, Cleveland 12, Ohio.*

Two white mercury lamps recently introduced are said to give as much as 63% more light than the old type, 33% lower cost of light and a better, white color than from clear mercury lamps. The reflector lamps are reported to direct two-thirds of the light to the work surface. They are 400-w lamps.

Tap Connector

(11) *Burndy Corp., Norwalk, Conn.*

Both run and tap elements of this L-type compression connector are factory filled with Penetrox A joint compound to assume more dependable aluminum tap connections. The compound is sealed in the proper place by a plastic dip that is stripped away before installation. A rip tape for stripping the plastic is color coded to indicate the size of the connector. Connectors are available for run conductors from No. 6 to No. 2 and taps from No. 10 to No. 2.



Magnetic Mounting

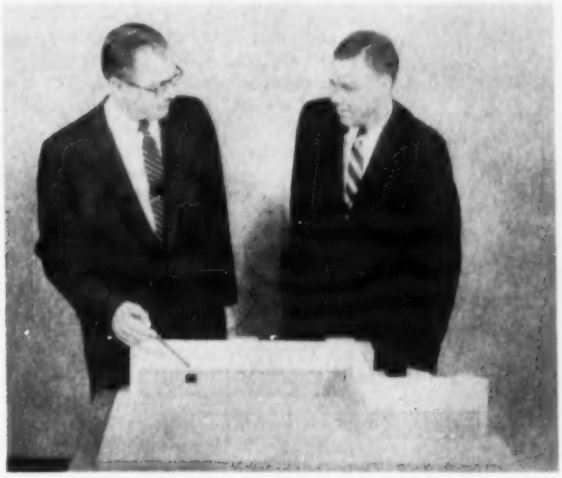
(12) *Line Material Industries, 700 W. Michigan St., Milwaukee 1, Wis.*

This company's transformer thermal overload indicators are now available with a permanent magnet mounting device. The device is said to aid with installation on transformers already in service. Indicators can be placed near the top oil level in any convenient location around the tank.

Improved Fluorescent Lamps

(13) *Westinghouse Electric Corp., Lamp Division, Bloomfield, N. J.*

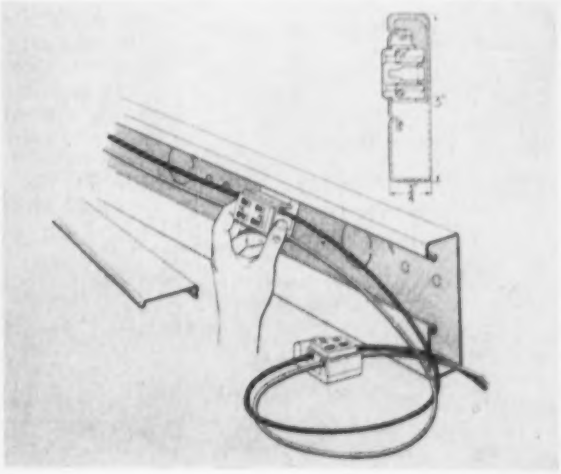
By using a newly developed high intensity fluorescent phosphor, this company has increased light output and reduced maintenance of fluorescent lamps. Called "Ultralume," the new phosphor uses no tungstates.



Baseboard Wiring System

(10) *National Electric Products Corp., Gateway Center, Pittsburgh, Pa.*

"Baseduct" is a new wiring system at the baseboard level that is installed directly on the floor and requires no footers, trim or capping. Only three fittings are required for the system: an end blank, a combination internal and external elbow for corners and a standard coupling. The system is available in 5-ft lengths with duplex receptacles on 30 or 60-in. centers. Receptacles are preassembled to the wiring harness at the factory.



THE TIME PROVEN
1929

FOR YEARS...
THE UNCHALLENGED
LEADER IN ITS CLASS

THE PORCELAIN PRODUCTS
1929 WIREHOLDER IS THE
"STANDARD", BECAUSE OF:

Good Basic Design ✓
Sound Engineering ✓
Uniform High Quality ✓
Competitive Pricing ✓
Dependable Service ✓
Up-to-date Packaging ✓

Plus a complete, quality line of secondary service materials!

63 Years
Electrical Porcelain Since 1894.
PP INC.
Porcelain Products, Inc.
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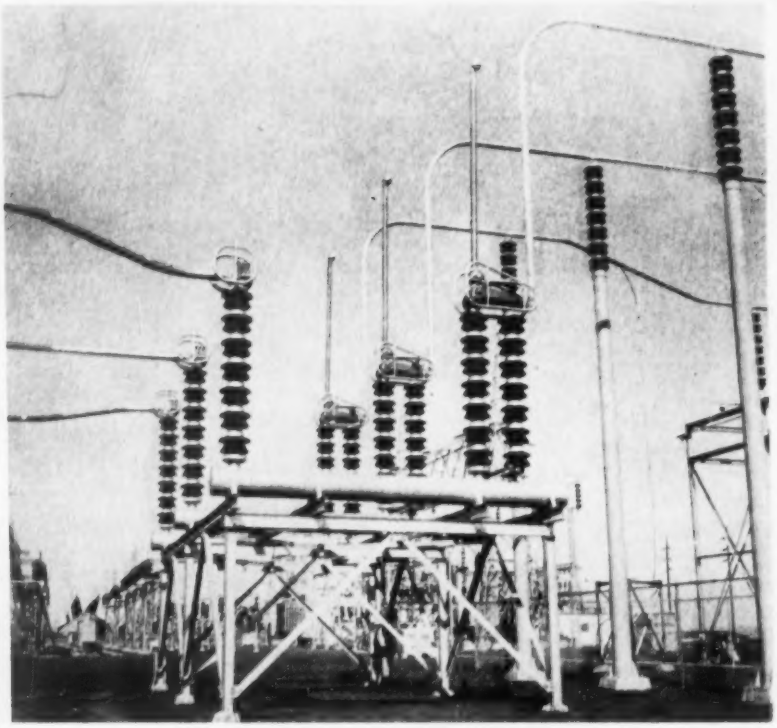


Now in service at the Umatilla, Ore., end of the 175-mile McNary-Ross transmission line of Bonneville Power Administration are these Federal Pacific Electric Co. TG-4 345-kv air switches. Rated at 1,600-amp continuous current, 70,000-amp momentary, and 1,300-kv BIL, the units are among the first in the United States to be operated at this voltage. The switches are in system supplying Portland

Guy Strand

(14) *Copperweld Steel Co., 322 Frick Bldg., Pittsburgh 19, Pa.*

New production techniques are applied to a new line of guy strands being introduced by this company. The guy strand, which is lower in cost, is offered in five strengths: three-wire strand, 2,200 and 4,000 lb; seven-wire strand, 6,000, 10,000 and 16,000 lb. The wire has a heavy copper sheath molten welded to an alloy steel core.

Multiduty Gin

(15) *A. B. Chance Co., Centralia, Mo.*

This multiduty gin can be used for pole top mounting, down-pole mounting or for lifting single transformers. The beam has a rocker action of 60° that controls the distance of the load from the pole. Clamped on top of a pole, the gin can be rotated in a full circle. In cases where it cannot be mounted on top of the pole, the gin can be mounted down the pole without changing the mounting bracket. Two models available are rated for 1,500 and 2,500 lb, respectively.

Safety Switches

(16) *Square D Co., 6060 Rivard St., Detroit 11, Mich.*

This company announces a line of safety switches to meet new NEMA standards. Three types of switches included in the line are: type LD for light duty, replacing D or G types; type ND for normal duty and commercial work, replacing former H, S, A or C designations; type HD for heavy-duty industry use includes NEMA 12 gasketed-type, watertight, dust-tight and explosion-resisting types. Manufacturer will supply full information.

Outdoor Receptacle

(17) *John I. Paulding Inc., New Bedford, Mass.*

This grounded outdoor receptacle has a bayonet-type cover that locks and seals by inserting and twisting. Sponge-rubber insert insures tight fit and eliminates corrosion problems, according to the manufacturer. Plate is solid brass sprayed with aluminum, and receptacle face is flush with the plate. A rubber gasket seals plate to siding or equipment. Rated at 15 amp, 125 v.

Plated Terminals

(18) *General Switch Corp., 45 Roebling St., Brooklyn 11, N. Y.*

This company announces that all terminal connectors for No. 6 AWG wire or larger in its pullout-type fusible service entrance equipment will be electroplated. The plating, which makes the connectors usable with either aluminum or copper wire, will be on all standard production items at no extra cost. Information available on special electroplating.

Offset Wire Bracket

(19) *Hubbard & Co., 6301 Butler St., Pittsburgh 1, Pa.*

When ice drops from a neutral conductor in a single-phase system, the conductor sometimes flips into the phase wire causing the phase and neutral conductors to burn. To prevent this, a new offset neutral wire bracket has been designed. It holds the neutral conductor away from the pole in a different vertical plane than the phase wire. Total extension from the pole surface is 16½ in.

MR. PRESIDENT:

WHAT DO YOU KNOW ABOUT RT&E?

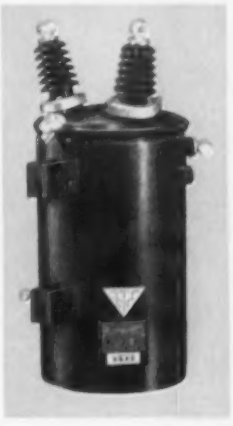
As one of America's leaders in the power industry, we think you should know something about one of America's leading suppliers of equipment to the power industry.

We said "leading" not largest. You should know that RT&E, while not big compared to the giants, is nevertheless big in service, in quality, in progress. We've packed hundreds of man years of experience into our ten years of manufacturing.

We think you'll approve our philosophy that we smaller suppliers are most important to the American economy. Sure, we'll be big some day, but in the meanwhile, we help keep the bigger boys on their toes.

For example, no other transformer manufacturer provides a 5 year guarantee or an externally operated tap changer as standard. We do.

All we want to say here is this: Remember the name RT&E. You'll hear it again.



RT&E CORPORATION
WAUKESHA, WISCONSIN

Equipment to help provide power for America

For FORMVAR

Anaconda has the quality

. . . Tri-State has the stock

Anaconda Formvar can take it! Its dense, smooth coating resists damage during winding . . . is not brittle . . . not affected by solvents used in most insulating varnishes. Formvar has high dielectric strength . . . long life . . . is available in film thicknesses equal to plain enamel and in thicker films.

Have you tried FORMVAR in pails?

You'll find real savings: no deposit; lower freight costs because pails are lightweight; fewer containers are needed; easier storage, because the pails hold more. Tri-State carries sizes #15 through #30 Heavy Formvar magnet wire in pails at three warehouses for quick service to you. Wire comes out of the pails smoothly, easily, with simple accessory. Your Tri-State salesman will be glad to give you full information and assistance.

57380A

For the nation's finest electrical, electronic, and industrial supplies, make

ONE CALL FOR ALL TOP BRANDS

TRI-STATE

SUPPLY CORPORATIONS

LOS ANGELES 13 • 544 South San Pedro St. MUtual 2354

SAN FRANCISCO 7 • 544 Bryant Street EXbrook 2-8890

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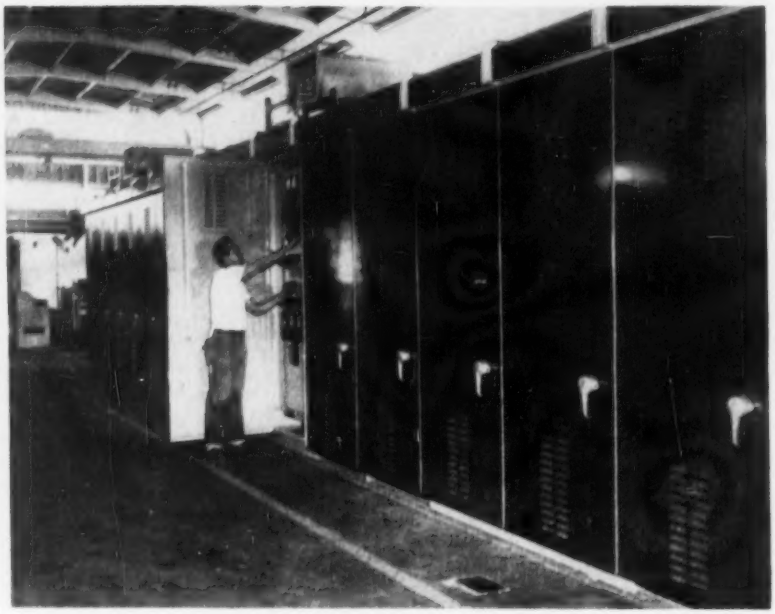


This 15-kv outdoor metal-clad switchgear to serve Seattle City Light's underground system is shown undergoing final tests in the Westinghouse Sunnyvale Division plant where it was designed and built. It goes in Seattle's Broad Street substation

Clock Hanger-Outlet

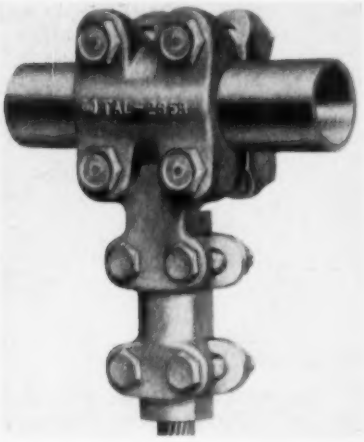
(20) *Royal Electric Corp., Pawtucket, R. I.*

An outlet specially designed to accommodate electric clocks is offered by this company. It has both a hanger for the clock and a recess for storage of the coiled cord. The receptacle unit provides for side wiring and has heavy-duty terminals and binding screws.

Thermal Demand Meter

(21) *Westinghouse Electric Corp., Box 2278, Pittsburgh 30, Pa.*

A new watt-hour thermal demand meter designed by this manufacturer indicates kilowatt-hours used and also the maximum kva demand. Kilowatt-hours are recorded by a single-phase watt-hour meter element. The kva demand is indicated by a thermal unit.



Tee Connector

(22) *Southern States Equipment Corp., Hampton, Ga.*

Recessed self-retaining bolt heads for single wrench assembly are featured in this new aluminum tee connector. Body is heat-treated aluminum and bolts are 24S-T4 aluminum.

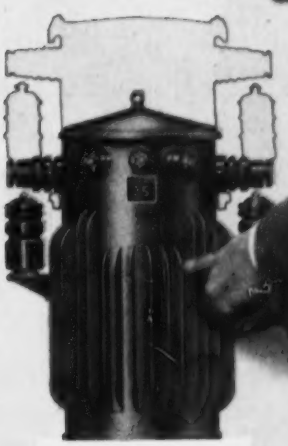
Your Westinghouse representative can prove...

NEW CHANGEOUT SAVINGS

Because all new Westinghouse transformers* are up to 13" shorter, 33% lighter, you can now make changeouts to next higher kva ratings without replacing poles or relocating secondaries

Among major utilities enjoying the advantages of Westinghouse "new-size" full-capacity transformers is Alabama Power Company, whose D. D. Wendel, manager of transmission and distribution, is seen here with John Main, Westinghouse Birmingham representative.

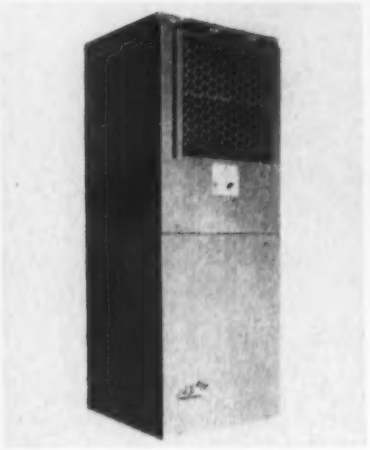
J-70787



*All ratings 25-167 kva

YOU CAN BE SURE...IF IT'S

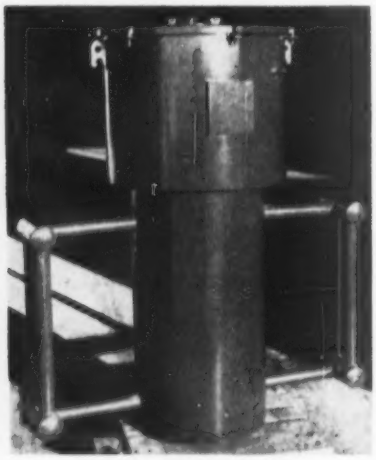
Westinghouse



Heat Pump

(23) *Typhoon Heat Pump Co., Tampa, Fla.*

Designed for year-around heating and cooling, this new heat pump line includes water-to-air, air-to-air and water-to-water units for residential and commercial use in sizes up to 40 tons. Admiralty metal condensers and copper heating and cooling coils are standard equipment.



Underground Transformer

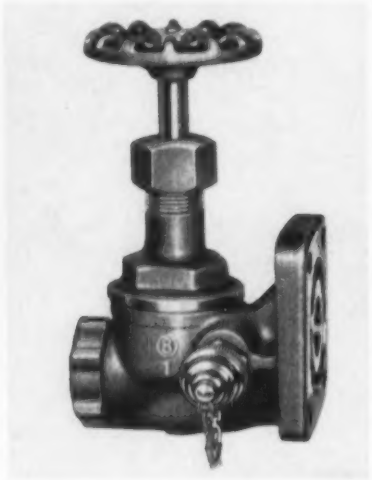
(24) *Electrical Service Co., Box 1039, Greenville, Tex.*

This new transformer is designed for complete direct burial in the ground with the top 3 to 4 ft below the surface. The primary circuit is carried in suitable cable, making its entrance through wiping sleeves or stuffing boxes. Special cooling tube arrangements permit installation by regular ditch-digging equipment. Design is said to give the transformer ample cooling area and double sealing.

Portable Core Cutter

(25) *J. F. Hamlin Co. Inc., 746 Ellis St., San Francisco 9, Calif.*

With motor and attachments, the weight of this new precision boring tool is said to be only 36 lb. The bit is turned 3,400 rpm by a ½-hp General Electric motor and will cut holes up to 6 in. per minute in any diameter from 3/16 in. to 2 in. Drills at any angle to a depth of 8 in., and deeper with extensions.



Apparatus Valve

(26) *Ohio Brass Co., Mansfield, Ohio*

Since the body of this new valve is offset below the mounting flange, the seat is actually ⅛ in. below the bottom level of the tank outlet when installed, the manufacturer reports. It is designed for transformers or circuit breakers. Available with or without sampling device in 1-, 1½- and 2-in. sizes.

AUTHORIZED

FWD

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P. O. Box 6186
Telephone: Alpine 3-8205

CALIFORNIA: Los Angeles, 7
CALAVAR CORP.
2700 South Broadway
P. O. Box 77250
Telephone: Richmond 8-6292

San Francisco, 7
THE FWD PACIFIC CO.
850 Harrison Street
Telephone: Garfield 1-4971

COLORADO: Denver, 16
MACDONALD EQUIPMENT CO.
5300 Colorado Blvd.
Telephone: Amherst 6-2641

IDAHO: Boise
FEENAUGHTY MACHINERY CO.
600 Front Street
P. O. Box 639
Telephone: 2-4579

MONTANA: Helena
STEFFECK EQUIPMENT CO.
1825 North Main Street
P. O. Box 1154
Telephone: Hickory 2-4450

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Telephone: Garfield 1-4971

CALAVAR CORP.
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P. O. Box 77250
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Telephone: Richmond 8-6292

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Telephone: JA 5-2136

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FEENAUGHTY MACHINERY CO.
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Telephone: Belmont 2-2186

UTAH: Salt Lake City,
KIMBALL EQUIPMENT CO.
1846 South 2nd West
Telephone: Hunter 4-6109

WASHINGTON: Seattle, 4
FEENAUGHTY MACHINERY CO.
1028 6th Avenue, South
Telephone: Elliott 7808

Spokane, 2
FEENAUGHTY MACHINERY CO.
No. 715 Division St.
Telephone: Fairfax 2514

WYOMING: Casper
STUDER TRACTOR & EQUIPMENT CO.
2300 East Yellowstone Highway
P. O. Box 779
Telephone: 2-5381

KIMBALL EQUIPMENT CO.
1846 South 2nd West
Salt Lake City, Utah
Telephone: Hunter 4-6109

TRAINED SERVICEMEN
GENUINE FWD PARTS

FWD doesn't skip the tough jobs ...works anywhere in any weather

When the shortest distance between two pole jobs is cross-country . . . you need FWD! New FWDs save time because you don't have to look for the level, easy way to get there. With FWD's unmatched power and traction you can travel straight to the job and do it, no matter how tough the terrain or weather. FWD is the only truck that is ready for line trouble emergencies—anywhere, anytime!

There's an important difference built into FWDs. They have full time, *true* four or six-wheel drive with both power *and* weight proportioned to each driving axle. This is the only way you are assured that every pound of weight is utilized to produce the kind of tractive power that doesn't skip the tough jobs . . . works anywhere in any weather!

Heavy-Duty Vehicle Specialists

THE FOUR WHEEL DRIVE AUTO COMPANY · **Clintonville, Wisconsin** · *Canadian Factory* · Kitchener, Ontario

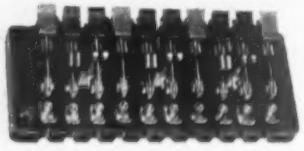
THE STATES COMPANY

YOU CAN ALWAYS DEPEND ON STATES TEST SWITCHES

for performance, safety, value!

Many companies have standardized on States Test Switches because:

1. No live parts extend beyond base—an important feature.
2. Maximum pressure at jaw contacts.
3. Nickel corrosion resisting finish insures good contact and attractive appearance.



Plus

NEW SAFETY GRIP HANDLE in STATES TYPE "SJK" TEST SWITCHES

Provides easier, safer gripping. New handle mounted on States exclusive angle blade gives sufficient jaw contact.

States testing equipment meets P.U.E.S.R. and National Meter Committee Specifications.

Write direct for full information—or to your nearest representative:

Arthur E. Booth Co. Los Angeles, Calif.
G. L. Hoffman Portland, Oregon
Geo. E. Honn Co. San Francisco, Calif.
J. E. Redmond Co. Phoenix, Arizona
Mt. States Machinery Co. Denver, Colorado
Conley Engineering Co. Salt Lake City, Utah

THE STATES COMPANY
HARTFORD, CONNECTICUT

BULLETINS ETC.

(27) TOOL CATALOG — Mathias Klein & Sons, 7200 McCormick Rd., Chicago 45, Ill., has issued a revised catalog of electricians' and linemen's tools and equipment. Dimensions of each part of every plier is a new feature.

(28) Kuhlman Electric Co., Bay City, Mich., has published bulletin CS-1010 to tell about a new line of indoor power center transformers for 300 kva and below. Engineering data, weight, dimensions and detailed schematic drawings are given.

(29) "How to Insulate a Cable" is a booklet that explains the four most-used methods of applying insulation to electrical conductors. It is available from Okonite Co., Passaic, N. J. Bulletin 1106 is presented as an aid in choosing the right cable design for specific needs.

(30) Bull Dog brand friction, rubber and plastic tapes are listed in a new catalog available from Advertising Department, Boston Woven Hose & Rubber Co., Box 1071, Boston 3, Mass.

(31) A wall chart showing conversion factors, such as watts to horsepower, inches to centimeters, etc., is available free of charge from Precision Equipment Co., 3714 N. Milwaukee Ave., Chicago 41, Ill.

(32) Minnesota Mining & Mfg. Co. offers an illustrated booklet describing four types of PTF electrical insulating films and tapes and their applications. Write to Department D7-41, 900 Fauquier St., St. Paul 6, Minn. Technical data are given.

(33) A technical booklet on Oct-O-Duct, a product of Soapstone Duct Co., 3985 Beach St., Oakland 8, Calif., is now available. The product is a conduit for power, telephone, street lighting and other circuits.

(34) A new edition of the well-known "See Your Home In a New Light" has been published by the Large Lamp Department, General Electric Co., Nela Park, Cleveland 12, Ohio. This is the third edition.

(35) Allis-Chalmers network analyzer facilities available to help solve system problems are described in a new bulletin released by the company. Allis-Chalmers is a participant in the a-c network analyzers at the Illinois Institute of Technology and the University of Wisconsin. Descriptions of the operation of the analyzers and the types of studies possible are in bulletin 1888526. Available on request from Allis-Chalmers Mfg. Co., 939 S. 70th St., Milwaukee 1, Wis.

(36) "Selecting SMD Fuse Units" is the title of a technical booklet available from S & C Electric Co., 4435 Ravenswood Ave., Chicago 40, Ill. It provides a step-by-step method of selection that covers: interrupting ratings, ampere rating selection, coordination, preloading adjustments, ambient adjustments, cooling time and overload protection.

(37) A new line of aluminum weld connectors for tubular aluminum bus is described in bulletin AW 50 of Penn-Union Electric Corp., Erie, Pa. The bulletin shows 13 different connector types.

(38) A service reported to improve the speed and accuracy of rate analyses for utility companies is described in a booklet available. It is published by Recording & Statistical Corp., 100 Sixth Ave., New York 13, N. Y.

(39) J. F. Pritchard & Co. of California has issued a technical and descriptive brochure on its Lo Line cooling towers for air conditioning and industrial service.

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after May 1

Please send me, without obligation, the new product information or catalogs:

If described in Product News, circle item number

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
38 39

If described in advertising, fill in page number

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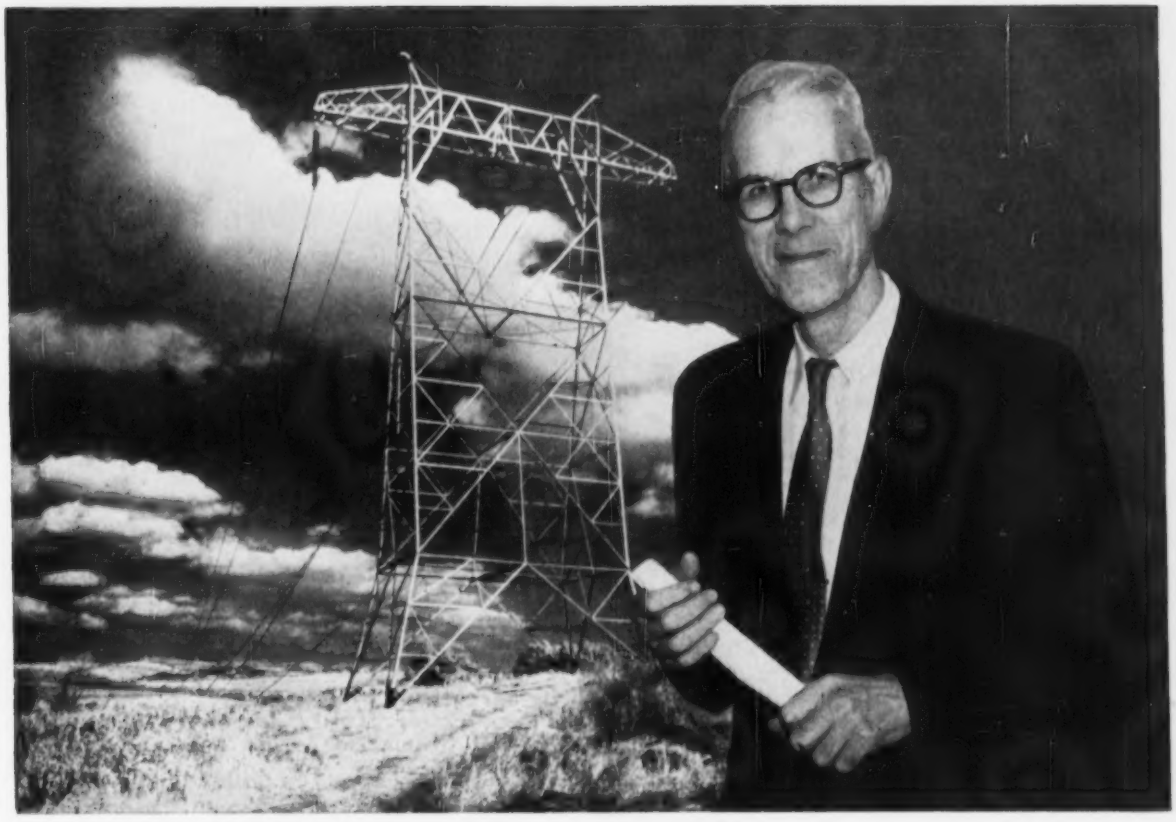
CITY ZONE STATE

*Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.



How the Bell System serves the power industry

"Reliability and economy influenced our choice of Bell System private line communications"

—E. W. Middleton, superintendent of system operation, Pennsylvania Power & Light Co.

The Lycoming switching station of the PP&L, one of many which are now remotely controlled through Bell System private line channels.

"Within the last five years, we've replaced many of our privately owned facilities with Bell System communications," says E. W. Middleton, PP&L system operations superintendent. "I can report now that these new communications are more reliable, economical and have greater capabilities."

Bell System channels for metering give PP&L's Hazleton dispatchers a continuous reading on generation and load throughout the company's 10,000-square-mile area. Channels for remote control provide centralized operation of many substations. And a private line telephone network connects Hazleton with control centers in seven service areas.

• • •

Perhaps your own communications deserve a fresh look. Why not call your Bell Telephone Company business office? A representative will be glad to study your needs.

BELL TELEPHONE SYSTEM

PRIVATE LINE TELEPHONE • PRIVATE LINE TELETYPEWRITER CHANNELS FOR: DATA TRANSMISSION • REMOTE METERING AND CONTROL • TELEPHOTOGRAPH • CLOSED CIRCUIT TV

New Hubbard Film Demonstrates Lightning Arrester Operation

The subject of power system lightning protection is complex and difficult to explain by conventional methods. This film, using new techniques of animation and ultra-high speed photography, facilitates the understanding of the many variables entering into the problem of lightning protection.

Produced in the Hubbard Research Laboratories especially for utility personnel, this film entitled "The Magic Cylinder" details formation of natural lightning, the effects of lightning on a power system, the duty on arresters, and the operational characteristics of the types in current use.

In full color and sound, with running time of 28 minutes, the picture is without counterpart in its educational coverage of this complex subject.

You can arrange for a showing of this brand new color film by contacting the Advertising Department of Hubbard and Company, 6301 Butler Street, Pittsburgh 1, Pennsylvania.

HUBBARD AND COMPANY

Pittsburgh 1, Pa. • Chicago, Ill. • Oakland, Calif. • Plano (Dallas), Texas

APRIL 1957

ELECTRICAL WEST SALES GUIDE News Letter

FOR THE ELECTRICAL MERCHANT OF THE WEST

Dynamic proof

The recent National Electrical Week promotion was the greatest single effort of its kind by an industry in Montana and the participation of every segment of the industry and its allies in the observance was dynamic proof of what we can do when we work together," D. J. Monigle, general sales manager for Montana Power, said at the March 11 dinner sponsored by his company to celebrate the first anniversary of Live Better . . . Electrically. He discussed plans to retain salespeople and augment its staff to help promote better electrical living. The dinner was attended by 360 Butte area men and women representing all segments of the industry. Frank J. Lynch, Butte division manager for the utility, was chairman of the meeting.

Speakers and demonstrations

Cowlitz County PUD wrote to the principal of each school in its service area explaining National Electrical Week and carrying a brief description of the district's adequate wiring demonstration panel, with the offer for a demonstration before science or other classes. Response was enthusiastic, with 17 demonstrations given and future appointments made. Letters to service clubs also brought requests for speakers during Electrical Week.

Two out of three for West

Pacific Coast utilities won two out of three top prizes in the nation-wide competition sponsored by Living for Young Homemakers magazine. Portland General Electric Co. took first award and Pacific Gas and Electric Co. the third prize for participation in the Electri-Living model home program. Engraved plaques were given out to the winners at the Adequate Wiring Conference in Chicago. Carrol W. Brissenden, PGE, received the top award for his company's co-sponsorship of the Portland Electri-Living home and Kenneth L. Hampton, PG and E, received the plaque for the home at Fresno from Edith Brazwell Evans, the magazine's editor. Awards were based on how completely had been realized the educational possibilities of the program and the extent of their promotion. Formula worked out by PGE in promoting the home will be told in a future article.

Drama used at center

Los Angeles Department of Water & Power's Van Nuys Service Center has had unusual success for a new facility, according to Jerry Allen, residential sales promotion manager. It was booked up solidly in March, reservations coming weeks in advance. The department has dramatized demonstrations at the new center. In a one-hour drama, a housewife is shown in the midst of all her problems (dishes, washing, interruptions when neighbors drop in). However, electric appliances get her through the day and bring a happy ending. The department plans to use the drama as a regular demonstration prop, changing the emphasis to suit the particular appliance campaign under way.

Promotes electric heat

Washington Water Power Co. is going ahead with plans to promote the use of electric heat for homes in its eastern Washington and northern Idaho service areas. Harold U. Wright of the sales department said there are now about 7,000 WWP customers using electric heat. He reported that the company has completed a two-year study of 51 Spokane homes averaging slightly more than 1,000 sq ft and has found that heating costs with electricity averages $169 a year. Cost per square foot per year for homes tested averaged 16.56c. By theoretical methods it had been estimated previously that electric heat would average from $230 to $250 per home per year.

Dryers move

Snake River Valley Electrical Assn.'s "Dryer Days" campaign brought good results during its first month. Figures available at press time showed that 832 dryers (and also 840 washers) were sold during the 30-day period, with another month yet to go. An essay contest, "I want an electric dryer because . . ." offered a dryer a week in prizes. Through radio, newspaper, TV and direct mail, the sponsors got 12,000 entries. Blanks were put out through dealer stores.

Factory branch

Sunset Electric Co. voluntarily relinquished Frigidaire distributorship in Portland and Seattle. The line is now being handled in those trade areas by a **direct factory branch** in charge of **W. H. Baldwin,** with headquarters in Portland. The new branch has leased Sunset's location and taken over most of the staff formerly working on Frigidaire. **A. L. Shellworth,** Sunset's Portland manager, says his company will keep Frigidaire distribution in Spokane but will not replace the line at Portland and Seattle. Instead, it will concentrate on manufacture and sale of its bulk milk cooler for farms.

Go with PP&L

With the change at Sunset Electric, its two home economists, **Grace Phipps,** Portland, and **Geanne Kinsner,** Spokane, went over to Pacific Power & Light Co. They will carry on an expanded program of "use and care" demonstrations among women's groups, schools, 4-H Clubs and similar organizations. Mrs. Phipps stays in Portland; Mrs. Kinsner goes to Kalispell, Mont. Both will be called "Polly Pacific."

Retires

Lucille Ramirez, for 29 years home economist with Washington Water Power and one of the deans of that profession in the Northwest, retired a short time ago. During her career she won several national awards for recipes and in 1948 she was given the Laura McCall Award for outstanding performance in utility home economics.

Stars pull in crowd

Kahn's of Oakland, Calif., was one of 15 winners in **Hotpoint's 60-day window display contest.** In celebration the manufacturer sponsored a program at the store on March 4, featuring Eva Gabor and Jerry Colona. The stars appeared in person in behalf of the Hungarian Relief Fund; autographed photos for donors. A record crowd turned out for the Monday evening performance. (See picture on p 141.)

For sales results

A. S. Gilbert, Idaho Power sales manager, awarded bronze plaques for outstanding sales results during 1956 at recognition luncheons held in connection with 1957 annual sales meetings. Top awards went to L. W. Brainard and S. C. Rhoads, division first place; Jack Grimmett, district; Jess Burns, commercial-industrial rep; Ernie Cantrall, residential and farm rep; Barbara Taylor, home service adviser.

New setup

Westinghouse home appliances and TV and radio receivers will be marketed through two new national sales organizations: Westinghouse Appliance Sales and Factory Field Sales. These organizations are in addition to established full-line independent and supplemental distributors, Charles J. Witting, vice-president and general manager, consumer products, stated. Westinghouse Electric Supply will continue to distribute apparatus and supply products and electrical housewares, fans and radio receivers.

Statistics

Grand total **TV set** distribution in the area served by Los Angeles Electric League was 2,722,819 at the end of January, according to Glen Logan, managing director. This includes 7,796 color sets. **Radio** distribution totaled 724,890, Jan. 1, 1955, to Jan. 31, 1957.

Still coming

Reports continue to come in on Western observance of Electrical Week. For pictures of three area celebrations, see p 143.

Use-Value meetings in West

Home economists in Phoenix, Los Angeles and San Francisco saw the Hotpoint 1957 appliance line at all-day Use-Value Training meetings last month. Frances Michael, director of the company's Home Economics Institute, Chicago, came to the West to present the program, which followed an entertaining script to show features of new models. Taking the form of a TV show, "The 1957 Spectacular" had such scripts as the Hit Parade of 1957 range features; This Is Your Life, home laundry; Bing Bong School, freezers; Wide, Wide World, electronic cooking center. Clara Sherburne, Hotpoint home economist in this area, visited the Western cities with Miss Michael and helped put on the program. In its third year, the program replaces the former meetings for home economists in Chicago. Last year Western meetings were in Los Angeles, Portland and Seattle.

New operators

G-E Supply has opened a new branch at 7340 Fulton Ave., North Hollywood. **Charles G. Collier** is store manager... **Boyce Mayer** has opened up a new business at 2047 El Cajon Blvd. in San Diego. He is using the firm names of Tee Vee Sales and United Radio, under which he operated formerly.

About people

People made this news: **Clayton L. Holm** of Phoenix has been made residential consultant and **Harvey Shahan,** Scottsdale, supervisor of commercial and residential development for Salt River Power District.... **Walter J. Herz,** formerly lighting engineer for Sierra Pacific Co., has assumed direct supervision of the new business department, with the title of supervisor of commercial and residential sales.

Points that won

Talking to Carl Richey about Sacramento Municipal Utility District's success in the General Electric appliance sales contest (Sales Guide, March), we learned that he and Mrs. Richey will make the trip to Europe. Some of the points that won the contest for SMUD are interesting. The district's 1956 water heater sales were up 69% over 1955 while national sales went down 3%; electric range sales at SMUD were up 25% while nationally they went down 1%; and the district increased dryer sales 27% while they were going up 16% nationally. Another factor in winning the contest for the district is the fact that sales promotion cost only $2.73 a customer, including customers of all classes. This amounted to 2½% of gross revenues.

NELPA to meet

NELPA'S Business Development Section will meet at **Vancouver Hotel,** Vancouver, B. C., on **May 6-8,** under chairmanship of A. S. Gilbert, Idaho Power. Arch Smith, B. C. Electric, Victoria, is chairman of arrangements, R. G. Scott, BCE, Vancouver, co-chairman. Program will be built around LBE and Housepower, with John Kimball, Idaho Power, and J. R. Poteat, G-E, Louisville, as keynote speakers.

All-out on ranges

The Los Angeles electric range campaign will be launched in April with a full-scale advertising program, including newspapers, billboards, TV, car cards and demonstrations, according to Glen Logan, managing director of the Los Angeles Electric League.

New in TV

Motorola has designed a special UHF antenna for portable TV sets; will include it without additional cost. Of the loop type, the antenna attaches to the back of the set; is rotatable.... The new **Packard-Bell** color TV receivers feature the Rangefinder 98 chassis; automatic chroma control to maintain color balance; automatic color killer to eliminate color in black and white. Prices are $595 in mahogany and $625 in blonde oak for consolette model and $695 in mahogany and $725 in maple for the console model.

Moves to Southgate

Rheem moved **production of electric water heaters** from Seattle to its Southgate, Calif., plant recently. The Seattle operation was scheduled to shut down in February.

Frank Folge's monthly progress report on

LIVE BETTER . . . *Electrically*

National Electrical Week huge success

National Electrical Week, Feb. 10-16, was widely and actively celebrated in the West in 1957. Many industry meetings were held, hundreds of talks given, and hundreds of proclamations were given wide publicity in a multitude of newspapers. In northern California the reports indicate an outstanding accomplishment by the Northern California Electrical Bureau and Pacific Gas and Electric Co., who acted as sponsors. A $20,000 prize award actively spearheaded the promotion from the retailer's standpoint.

Live Better Electrically big spring push

The Live Better . . . Electrically big spring push is all set to go. Ads in nine top retailing publications in February told dealers about the **"How does your kitchen rate"** ad to appear in 10 leading consumer magazines in April, May and June, and what dealers could do to profit. It mentioned the retailer kit now available including posters, blown-up ads, signs, price tags and a 28-page booklet "Advertising Aids for Electrical Retailers." **A second ad will appear in March** retailer trade publications and it will include powerful testimonial support from Frigidaire, G-E, Westinghouse, Philco, Kelvinator.

EEI calendar for spring

The EEI residential promotional calendar features **"Stay Clean"** kitchens and **"Why Worry — Get an Electric Water Heater and Live Better . . . Electrically"** for promotion in March, April and May. Live Better . . . Electrically advertising kit No. 3 is available to tie-in. Advertising kit No. 4, Electric Freezer Promotion, and No. 5, Electric Housewares Promotion, are also available.

Light for Living test brings results

The Light for Living test program has successfully completed its second year, under the sponsorship of Kansas Gas & Electric and Mississippi Power & Light, with a 10-year objective of 1,000 kwh per test area customer. In 1956, **30 w per consumer of home lighting were added**—more than 800 rooms and 25 existing homes were light conditioned; more than 4,000 ft of lighted valances and 3,000 new fixtures were added.

No place for germs

The University of Louisville reports that the newest General Electric dishwasher cleans dishes **so clean that they average less than one germ per dish,** whereas the permissible limit for restaurants is 100 germs per utensil. Handwashing averages almost 400 germs per utensil.

The grass is growing

Springtime is here and the grass is getting longer. Sunbeam ads are featuring a low cost, quiet, light weight electric lawnmower that makes cutting the lawn fun.

Quick change

Reduction of electric water heater models from 175 to 12 is the final decision of the General Electric Co. This verdict is acclaimed here in the West where electric water heating is important to the electric living we enjoy and where all utilities recognize the value of quick recovery water heaters.

Adequate for the garage

Garages in the West are being **wired for Better Electrical Living.** Features frequently include an electrically operated workshop, an electrically operated door for convenience and to prevent accidents, a laundry center with electric washer and dryer, adequate outlets for vacuuming the car, running the electric mower, etc., and of course good lighting, which means lights on each side of the car so as to be really useful.

HOUSEPOWER

DEAD END WITH

BLACKBURN

W6-2A from 6 Sol to 2 ACSR
This Clamp Will Handle All
Popular Service Drop Wires

WEDGE CLAMPS

For Light Service
W6-4A
6 Sol to 4 ACSR

For Heavy Service
W2-OA
2 Sol to 1/0 ACSR

Conductor in contact with wedge for entire length of slider.

Removable aluminum slider allows installation without threading through clamp.

Drop wire can be pre-sagged and cut to exact length needed.

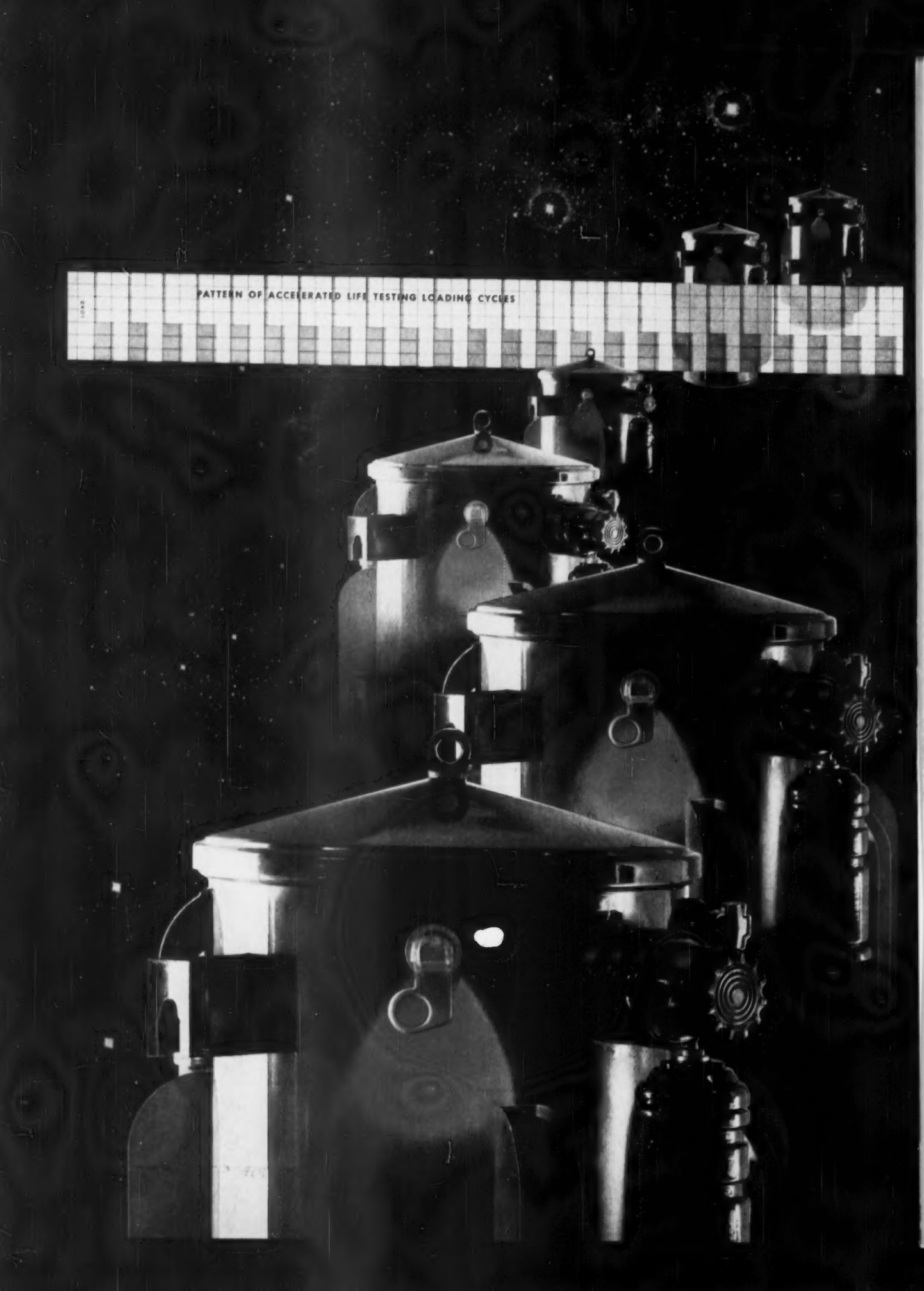
Can be attached to bare neutral at any point in the span.

Your Choice of 3 Bails

STANDARD FLEXIBLE CAPTURED FLEXIBLE FREE

JASPER
BLACKBURN
CORPORATION

35 MADISON STREET • ST. LOUIS • MAIN 1-2821


PATTERN OF ACCELERATED LIFE TESTING LOADING CYCLES

Helping the industry meet its growing loads

Transformer life-testing today . . . a new "known" to help you plan 1987 equipment investment

Increasing loads, changing load patterns dominate the industry's equipment planning today. These same factors are forcing transformer investment programing further into the future, further into the unknown of ultimate transformer performance.

Throwing new light onto such problems as load capability, equipment aging, transformer retirement is a unique new Westinghouse concept—accelerated life-testing of distribution transformers. Life-testing means transformers are subjected to a series of tests representative of actual service conditions—30 years of normal equipment life are packed into three. Range of tests and duty cycles used provide a complete thermal, electrical and mechanical life-performance check on completely assembled, standard transformers.

Now, and for the first time, the effect of design changes on the life expectancy of a transformer is predictable. Already, accelerated life-testing offers utilities a complete prove-out on the recently announced 20% increase in overload capability of all Westinghouse distribution transformers.

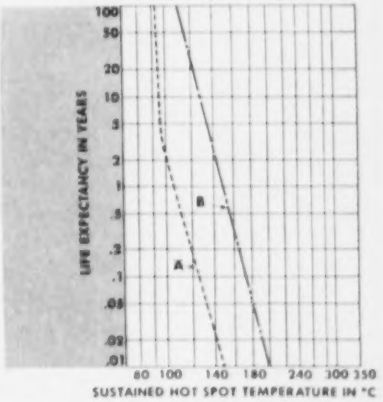
The evidence being gained from functional life-testing permits more accurate forecasts of the service life expectancy of transformers under a wide range of conditions. It will help you load transformers closer to optimum. Permit planned change-out schedules. Enable you to utilize equipment more fully. In short, here is a new and singular management tool to help utilities mate products to modern load demands. J-97199

YOU CAN BE SURE...IF IT'S

Westinghouse

Pretesting Transformer Life . . .

Functional life-testing is a new and realistic technique for establishing life-expectancy standards for transformers. Pioneered by Westinghouse and developed by A. M. Lockie, design engineer, this accelerated life-testing is programed in two ways—testing to the point where transformers are no longer fit for service, and testing to destruction. Procedures are based on experience obtained from putting transformers through 2,200 overloads, 30 short circuits at 15 times rated current, a series of impulse, dielectric and induced potential tests, and daily load cycles up to 450% of rating. For full description, see Lockie's AIEE papers, "Functional Life-Expectancy Tests for Liquid-Filled Transformers" (55-520 and 53-243).



Data obtained from functional life-tests now shed new light on transformer life expectancy, and show the practicality of heavier loading. Curve "A" is the life-expectancy curve derived from the ASA guide for loading transformers—the generally accepted guide before the development of functional testing. Curve "B" was published by Westinghouse in 1953 as the result of early functional tests which helped to determine circuit breaker settings used then. Tests conducted since 1953 show that, for Westinghouse distribution transformers, even curve "B" is conservative, and have led to the pioneering of higher breaker settings. Here is a new "known" to help you plan 1987 equipment investment.

Call your Westinghouse representative for more information.

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4 EXCLUSIVE REASONS WHY...

APPLETON

vented Explosion-Proof Fixtures are BETTER!

- **"FLAME-TIGHT" CONTACT CHAMBER**
  Exclusive safety chamber prevents explosions even when fixture is serviced with current on! APPLETON *Series AA-51 Vented Explosion-proof Fixtures* offer the positive protection required for hazardous areas.
- **"FULL-CIRCLE" VENTING**
  Porous metal interior and specially designed hood dissipate heat evenly and safely . . . keep fixture temperature down, provide longer lamp life.
- **"INTERCHANGEABLE" UNILET BODY**
  Standardized diameters at top of Dome Unit Assembly permit interchange with AA-51 fixtures of varying wattages.

plus conversion to different wattages or relamping in just 58 *SECONDS!* . . . with no loss of man-hours or lengthy shut-downs. Send for complete information today!

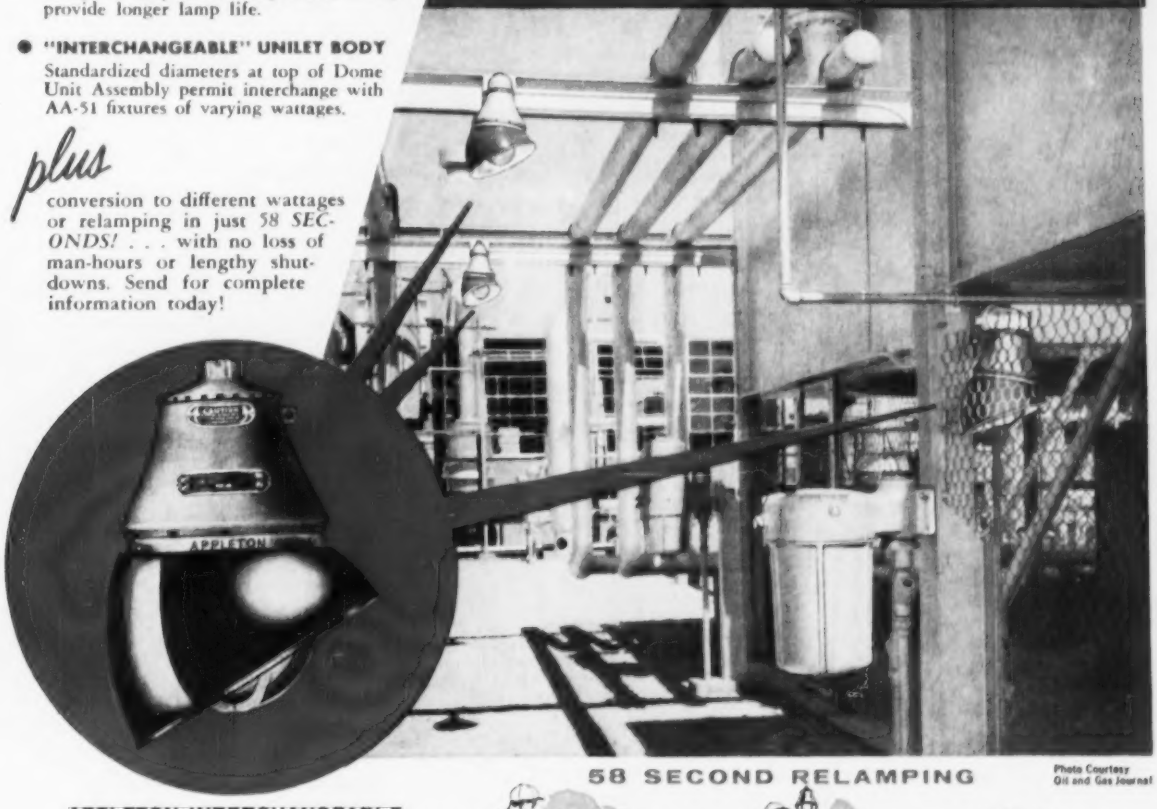
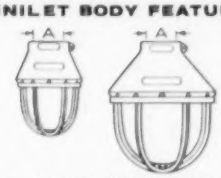


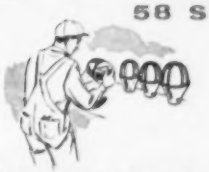
Photo Courtesy Oil and Gas Journal

APPLETON INTERCHANGEABLE UNILET BODY FEATURE



Note how identical diameters "A" on Dome Assemblies allow quick interchange of fixtures with different wattages.

58 SECOND RELAMPING



Series AA-51 stand-by units are ready at an instant's notice for relamping . . . with handles attached in advance.

Only a screw driver is needed to change units . . . and **ONLY 58 SECONDS** to climb ladder, change unit and descend!

Cleaning fixtures, changing burned out lamps can safely be attended to at bench . . . preventing costly shut-downs.

APPLETON ELECTRIC COMPANY
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Also Manufacturers of:

Industrial Lights

Automatic Reelites

Malleable Iron Unilet Fittings

"ST" Series Connectors

Outlet Boxes

Sold Only Through Selected Wholesalers

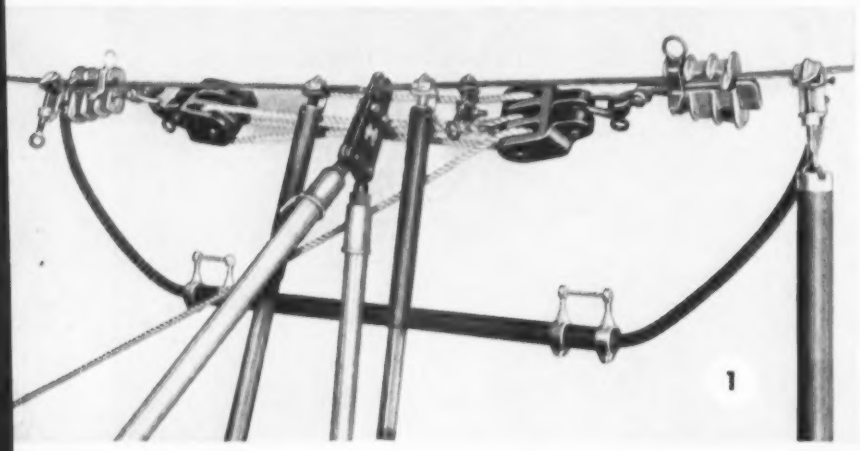
APPLETON ELECTRIC PRODUCTS

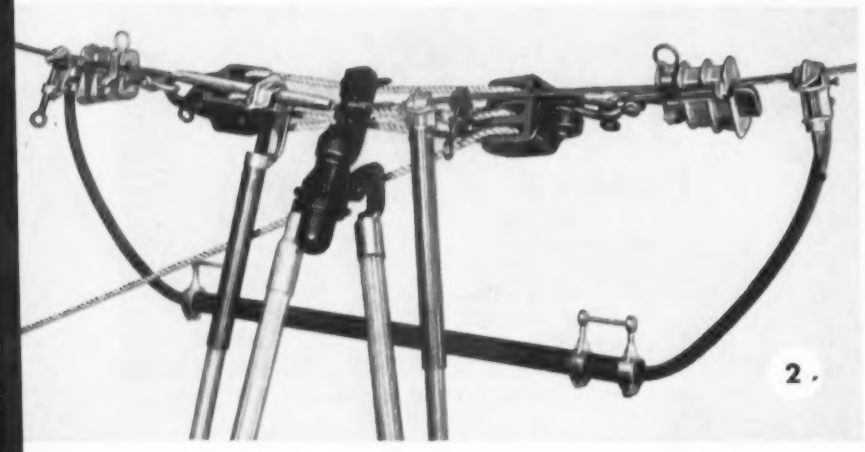
Rely on APPLETON . . . *the standard for better wiring*

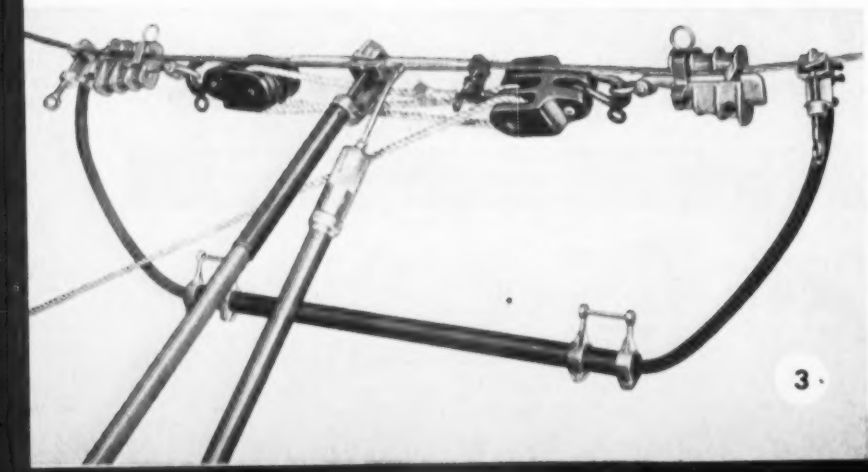
New KEARNEY Method Simplifies

Year by year, uninterrupted continuity of service becomes increasingly important in American homes and industry. Up to now, when it became necessary to make a line splice on ACSR, customer inconvenience and loss of company revenue were unavoidable because the hot line had to be killed before work began.

This new compression splicing method was developed and perfected by Kearney specialists in hot line work. It not only simplifies the making of hot line splices on ACSR, but also provides time and cost savings. Only brief demonstrations are required for linemen to grasp the complete Kearney technique, and the necessary tools, equipment and connectors have proved themselves in use on power lines throughout America.







(1) INSTALL EQUIPMENT, CUT WIRE—After conductor is thoroughly cleaned with a wire brush, cum-a-longs are installed, insulated rope blocks are hooked into the clevises of cum-a-longs, and a fiberglass insulated jumper installed on the conductor.

Next, both the steel and aluminum sleeves are measured, so that properly spaced cuts may be made in the conductor. A hot line clamp is placed on the conductor at the end of the aluminum sleeve, so that the aluminum sleeve is properly centered over the steel sleeve.

Holding tools are installed to prevent fraying of the aluminum strands when cutting with a pre-splice cutter. Three cuts are made in the aluminum strands so that the steel core can be installed, one at the center of the steel core, and one at each end.

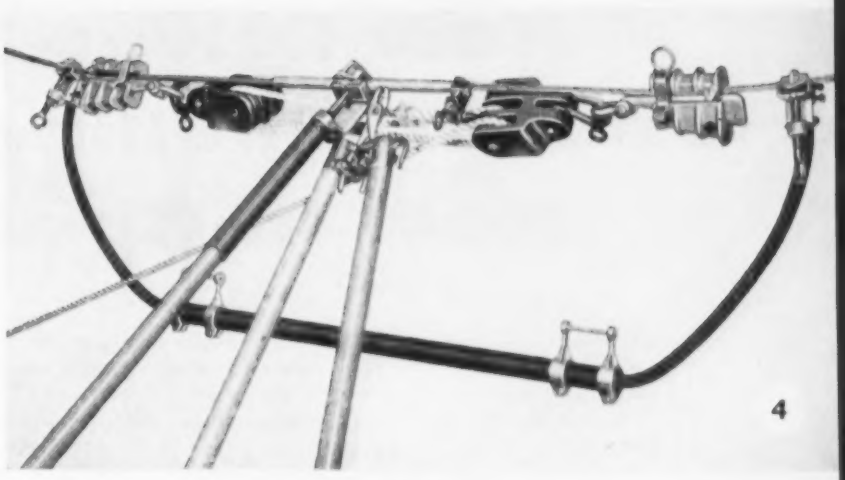
(2) SLIP ON SLEEVES—After the steel core is cut, the aluminum sleeve is slipped over the conductor. The steel sleeve is then installed, and compressed on the steel core. After the steel sleeve is compressed, the aluminum sleeve is pulled up over both ends of the aluminum conductor—and up against the hot line clamp which was placed for centering the aluminum sleeve.

(3) PROTECT CONTACT SURFACES—After aluminum sleeve is centered, the cleaned contact surfaces are protected by forcing Kearnalex inhibitor into the sleeve through the grease holes, using a special grease gun.

Hot Line Splicing on ACSR

(4) INSERT PLUGS—With a pair of insulated combination pliers, plugs are securely inserted in the grease holes of sleeve.

(5) COMPRESS SLEEVE—Insulated rope blocks and cum-a-longs are taken off. Aluminum sleeve is now compressed with a Kearney WH-1 hydraulic compression tool, starting from the plugs and working out toward each end. After aluminum sleeve is compressed, the joint will hold 100% of the breaking strength of the conductor.



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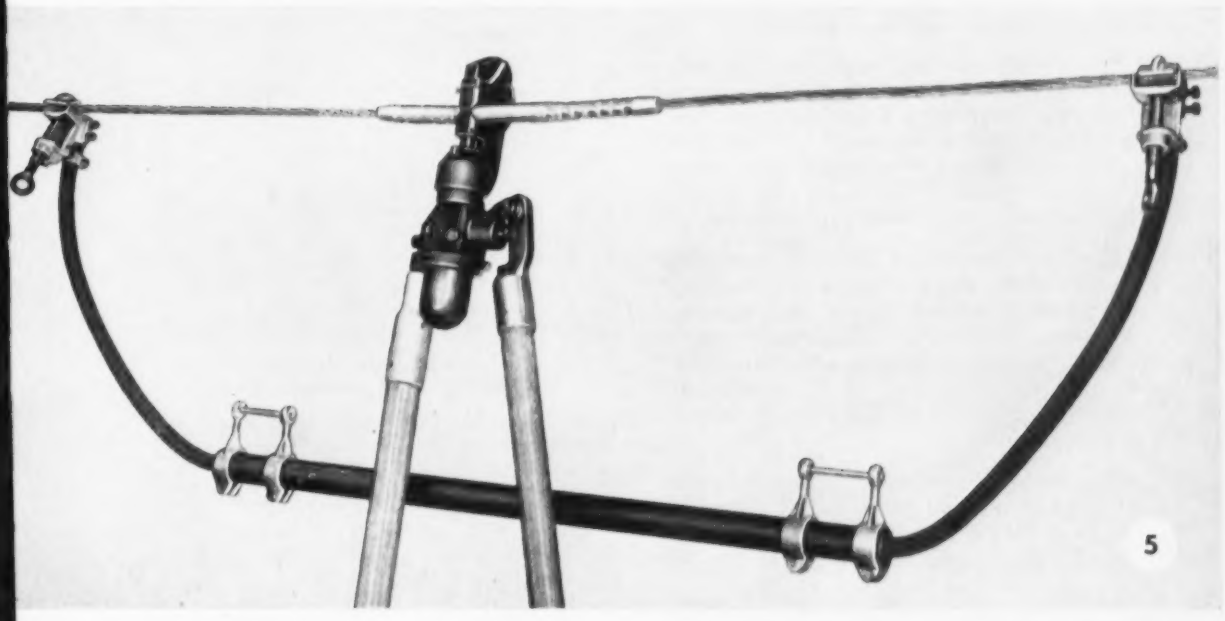

5

Make an appointment through your Kearney Representative for a demonstration soon.

JAMES R. KEARNEY CORPORATION

General Offices: 4224-42 Clayton Ave., St. Louis 10, Mo.

Plants at: ST. LOUIS • FAYETTEVILLE, ARK.
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356

FOR BETTER CONSTRUCTION...SAFER MAINTENANCE
Specify **KEARNEY PRODUCTS**

Here's everything you need to do the complete job!

Quantity	Item	Kearney Cat. No.
1	Hydraulic Compression Tool with Dies	WH-1
1	Fiber Glass Saf-T Hook Stick	4266-2
1	Pre-Splice Cutter	1870-34
1	Cum-a-long	1833
1	Cum-a-long	1833-1
1	Conductor Cleaning Brush	4455-62
2	Small Jumper Holding Tools	20852-1
1	Large Jumper Holding Tool	20852-6
1	Insulated Blocks with Nylon Rope	4999
1	Insulated Jumper, 8'	3950-1
1	Insulated Grease Gun, 6'	26625-1
1	Insulated Pliers Holders	4773-1

IN THE WEST: for prompt service, contact Kearney's West Coast Distributor, **Maydwell and Hartzell, Inc.,**
Los Angeles • Seattle • Portland • San Francisco • Spokane • Phoenix.

Attention! All Users of Nickel Alloys...

New Driver-Harris Vacuum Melting Service Now in Operation

After many years of experience with vacuum melting programs, Driver-Harris now offers a complete vacuum melting service for almost all of the 132 special purpose alloys made by this company.

The specific benefits gained by vacuum melting in the production of nickel-chrome alloys are today clearly established. They are:

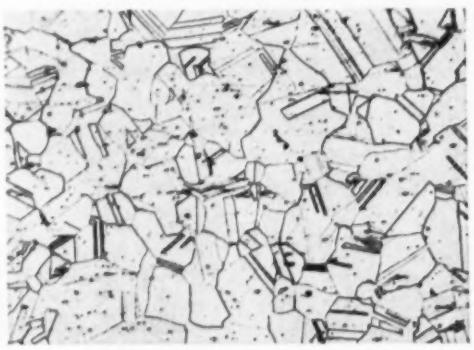
1. Much closer control of analysis—particularly in alloying with the highly reactive elements, Titanium, Aluminum, Columbium, Calcium, and Zirconium. The normally high affinity for nitrogen and oxygen these elements have is completely eliminated in vacuum melting, thereby opening new avenues in alloy production.

2. Great reduction in inclusions, especially oxides and nitrides, results in higher ductility and tensile properties. In fine wires, the improvement in properties is frequently so great that wire sizes may be reduced without sacrifice of strength. An example of the greatly improved microstructure is illustrated in the metallographs shown.

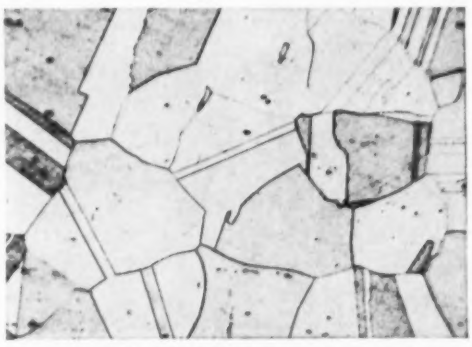
3. Complete elimination of gas, not from the surface only but from the entire mass. Alloys so produced are therefore more desirable in the manufacture of electron tubes.

4. General improvement in electronic, electrical, and mechanical properties to meet specifications. Because closer control of analysis is a primary advantage of vacuum melting, we can now achieve these specific improvements with remarkable certainty.

Almost all of the Driver-Harris Alloys now vacuum melted and processed under close physical and analytical control show improvement in one or more of the above ways. If you are seeking further improvements in the D-H Alloys you use, inquire now for information on how Driver-Harris Vacuum Melting Service can help you. Address your inquiry to Dept. VMS.



Polished and etched sample of Air Melted NICHROME V in annealed condition.*



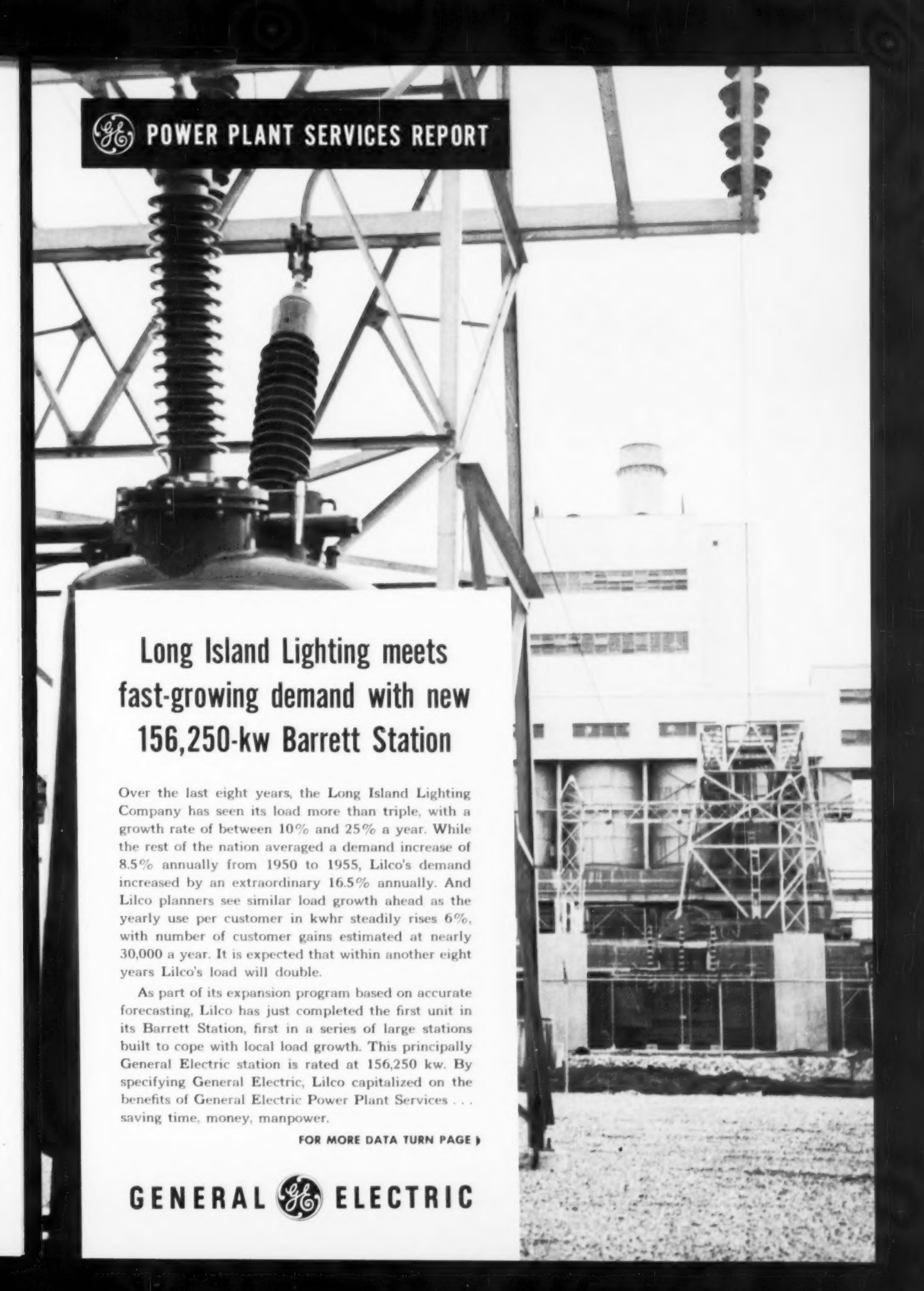
Vacuum melted NICHROME V, annealed. Note that reduced inclusions result in much larger grain size for the same annealing treatment.

*T.M. Reg. U.S. Pat. Off.

Driver-Harris COMPANY HARRISON, NEW JERSEY

Western Representative: ANGUS-CAMPBELL, INC. • 4417 S. Soto St., Los Angeles 58 • 760 Tennessee St., San Francisco 7

MAKERS OF THE MOST COMPLETE LINE OF ALLOYS FOR THE ELECTRICAL, ELECTRONIC, AND HEAT-TREATING INDUSTRIES



POWER PLANT SERVICES REPORT

Long Island Lighting meets fast-growing demand with new 156,250-kw Barrett Station

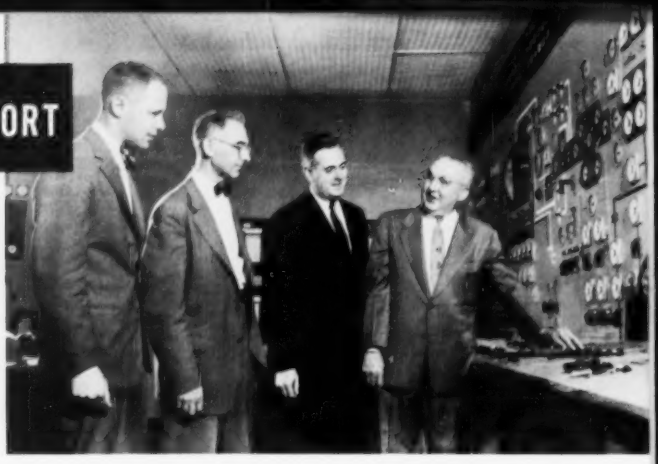
Over the last eight years, the Long Island Lighting Company has seen its load more than triple, with a growth rate of between 10% and 25% a year. While the rest of the nation averaged a demand increase of 8.5% annually from 1950 to 1955, Lilco's demand increased by an extraordinary 16.5% annually. And Lilco planners see similar load growth ahead as the yearly use per customer in kwhr steadily rises 6%, with number of customer gains estimated at nearly 30,000 a year. It is expected that within another eight years Lilco's load will double.

As part of its expansion program based on accurate forecasting, Lilco has just completed the first unit in its Barrett Station, first in a series of large stations built to cope with local load growth. This principally General Electric station is rated at 156,250 kw. By specifying General Electric, Lilco capitalized on the benefits of General Electric Power Plant Services . . . saving time, money, manpower.

FOR MORE DATA TURN PAGE ›

GENERAL ELECTRIC

TREND to reduced basic insulation levels in large transformers is shown by 138-kv, 190,000-kva forced oil air-cooled unit insulated for 550 kv-BIL. L to r, E. Bateman, G.E.; Lilco engrs., C. Kiel, Jr., M. Marshall, A. Jorgenson.



SCHEMATIC LAYOUT, both mechanical and electrical gives complete instrumentation, increases efficiency of G-E control board. Lilco's G. Raulston explains operating advantages to M. Lennig, G.E.; E. Deturk and M. Buckley of Lilco.

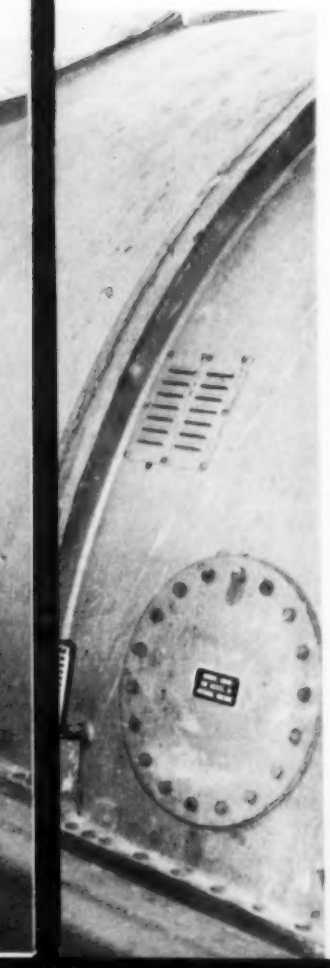
Northeast's newest

UNUSUAL ARRANGEMENT for Northeast is outdoor General Electric tandem-compound, triple-flow, reheat unit rated at 156,250 kw. Lilco V.P., E. C. Duffy, and Asst. V.P., W. O. Smith, discuss station design with G.E.'s E. R. Cotton and Lilco Asst. V.P., W. Welch, Jr. Turbine, generator and exciter are well protected against cold and weather hazards.

EASILY INSPECTED drawout air circuit breakers are a feature of Long Island Lighting's installation of General Electric 480-v switchgear used to control and protect station auxiliaries. Above, Operator R. G. Schmalfeld inspects breaker.

ENGINEERING TEAMWORK provides minimum cost, optimum efficiency for new station. G-E Sales Engineer Wharton Clay, Jr. discusses new equipment with Lilco Engineers B. Kelly, J. Martone, A Colyer, A. Denike, J. Carll, Jr.

outdoor station expedited through co-ordinated engineering of Lilco, G. E.



The construction of outdoor generating stations in the Northeast has been a recent development. Barrett Station is the newest of three such power plants on Lilco's system. That the Long Island Lighting Company should select such a design for an area prone to considerable temperature changes, often with harsh winters, and the year round action of salt water from the adjacent Atlantic Ocean, is a tribute to imaginative management action and highly competent utility engineering planning.

RELIABILITY ESSENTIAL

The physical characteristics of the Edward F. Barrett Station's site demanded the best in equipment reliability and engineering. Working very closely with Lilco engineers, General Electric application engineers helped to select and integrate the most suitable apparatus for the job. This mode of operation was carried through from planning to start-up, conserving utility engineering manpower and bringing the combined skills and experience of many General Electric specialists into all phases of the program.

MULTIPLE BENEFITS

This is typical of the many ways in which General Electric Power Plant Services can assist on your job. Some of its other aspects are product development engineering, field service engineering, power plant co-ordination and service engineering which also help to:

- **Simplify ordering of equipment**
- **Conserve engineering time**
- **Integrate equipment design**
- **Speed construction**
- **Assist in training operators**

For full information on these Power Plant Services, contact your General Electric Apparatus Sales Office or write for 28-page bulletin GEA-6320 to General Electric Company, Section 302-14, Schenectady 5, N. Y.

FOR MORE DATA TURN PAGE ▸

MORE POWER TO AMERICA

GENERAL ELECTRIC

POWER PLANT SERVICES REPORT

CO-OPERATIVE PLANNING is typified by this group, (l. to r.) Asst. Mgr. Eng. Dept., A. C. Sugden; Asst. V.P. William Welch, Jr.; and Mechanical Engineer William J. Burns of Lilco, in discussion with General Electric Application Engineer M. Lennig, Lilco Planning Engineer, J. L. Davidson, and Electrical Engineer E. F. Deturk.

General Electric application engineers help your planning team keep costs minimal

Simplified planning from basic concept to station completion is key to savings

When Lilco forecasters determined, in terms of area load growth, the necessity for increasing system capability, a power plant planning team went into operation. General Electric application engineers were an integral part of this team. One of their vital contributions was to provide guidance to help determine what basic concepts and equipments best suited Lilco's requirements. This planning resulted in the most efficient and economical station for Lilco's needs.

In many cases the General Electric power plant service team works closely with electric utility engineers and their consultants from initial planning through equipment selection, installation, and start-up. The net result of such co-operation is substantial savings to you in time, money and manpower.

As the trends in power station equipment continue to require higher ratings, improved efficiencies, and even greater reliability, the advantage of selecting General Electric apparatus, combined with the time-saving, money-saving benefits of General Electric engineering team-work, offers electric utilities a striking example of why it pays to call in General Electric early when planning a new station.

LIVE BETTER ELECTRICALLY

MORE POWER TO AMERICA

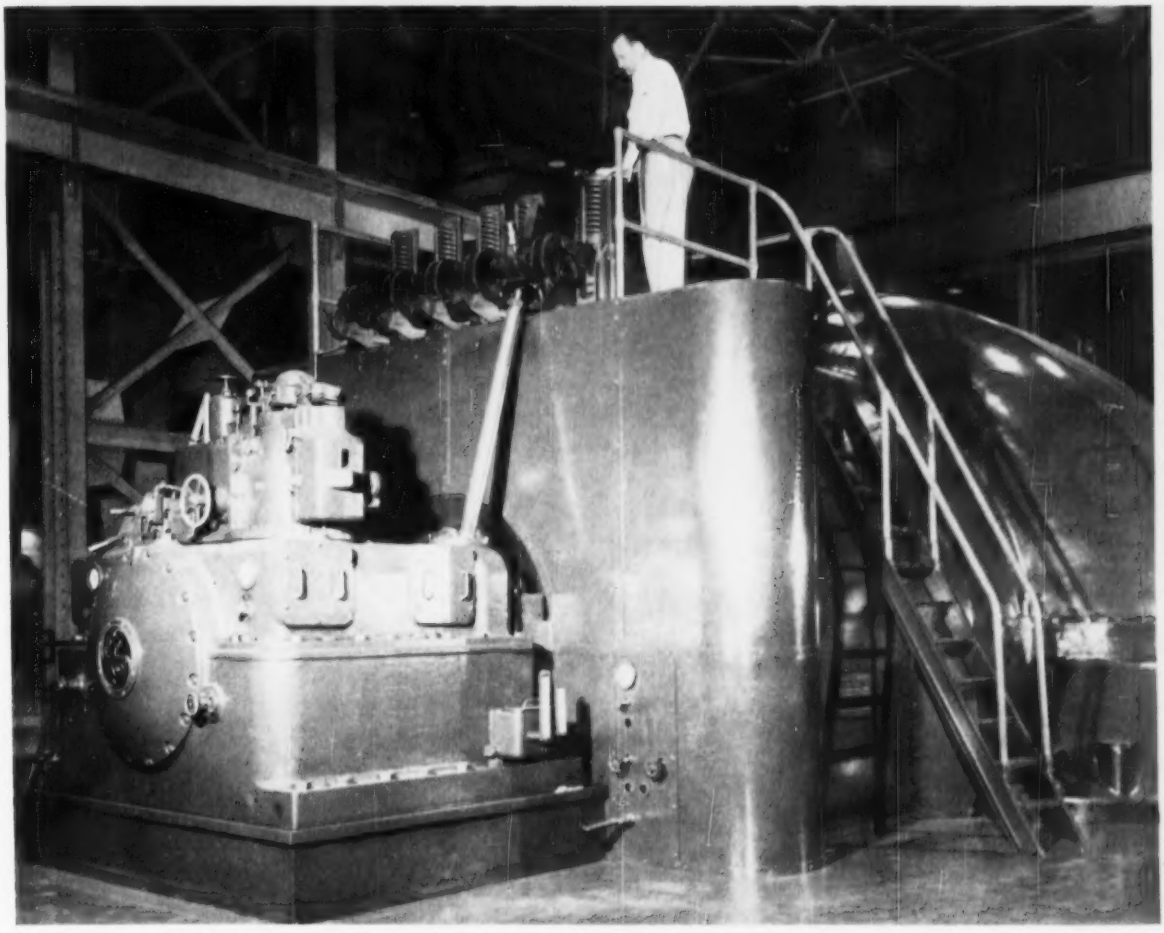
GENERAL ELECTRIC

STANDARD ENGINEER'S FIELD REPORT

LUBRICANT CHEVRON* OC TURBINE OIL

FIRM U.S. STEEL CORP. Geneva, Utah

Oil Neutralization No. only .07 after 100,000 hours



Chevron* OC Turbine Oil is used in this General Electric turbine which is the principal source of power for United States Steel Corporation's mill at Geneva, Utah. After 100,000 hours operation the oil in this 50,000-kw turbine-generator showed a neutralization number of just .07—identical with the number of the original 7,000 gallon charge made in 1943. During regular inspection and servicing periods, the oil was drained, purified, and put back in service. No "sweetening" of the oil, and no other down time was required during the entire 100,000 hour period. Chevron OC Turbine Oil is also used in mill's four 11,350 hp turbo-blowers.

For More Information about Chevron OC Turbine Oils call your Standard Representative, or write 225 Bush Street, San Francisco 20, California.

*The Chevron Brand covers the line of industrial products formerly sold under the Calol name. This is a name change only. The high quality and specifications remain the same.

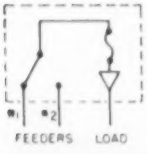
Why Chevron* OC Turbine Oil prevents sludging, rusting and wear

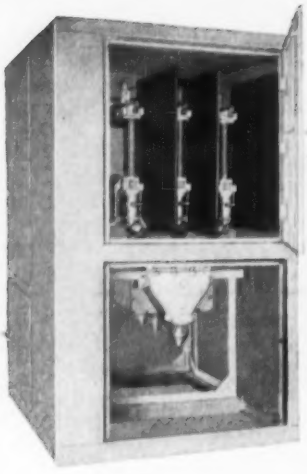
- Excellent metal wetting ability keeps oil on bearings and gears under heaviest loads
- Oxidation inhibitor prevents sludge, gum, and lacquer formations
- Corrosion inhibitor stops rusting

CHEVRON Industrial Lubricants

STANDARD OIL COMPANY OF CALIFORNIA

"SC-RAD-F" UNICLAD, including: Feeder selector oil switch, 3 pole, 15 Kv., 400 amp. full load break; with Model "F" automatic transfer mechanism. "SC" power fuses and pothead for load connection.

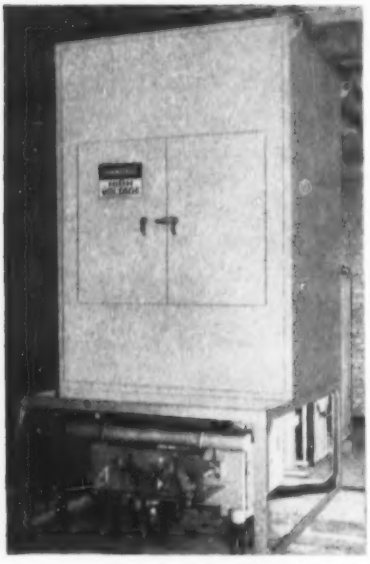




Right side opened to show disconnecting type power fuses and load cable pothead. The pothead can be 3 conductor as shown or 3 single conductor.

Left side panel and cover plates removed to show details of oil switch (with control transformers) and of cable terminating compartment. Also note Model "F" automatic operating mechanism. Oil switches can be furnished for full load break manual operation instead of automatic.

G&W UNICLAD SAVES INSTALLATION & MAINTENANCE COSTS



Loop feeder "RAL" load center oil switch, 3 pole, 34.5 Kv., 400 amp. full load break—Power fuses and current transformers in upper compartment—Load transformer in rear.

Primary Service Switch-Fuse Units *enclosed in metal cabinets for safety and appearance.*

G & W combination load break oil switch-fuse primary service units—in economical functional designs have been furnished for many years. They help maintain service continuity and provide load circuit protection. They have a remarkable record of trouble-free operation—with a minimum of maintenance.

The oil switches, fuses and other component parts are now factory assembled as UNICLAD metal enclosed units—which present a neat and harmonious appearance in indoor or outdoor locations. The enclosure of porcelain bushings, live lugs and connections promotes safety.

The arrangement of equipment within the UNICLAD enclosure is such that ready access is provided for termination of feeder and load cables, for maintenance of oil switches and mechanism and for replacement of fuses.

UNICLAD switch-fuse units are custom designed for practically any primary service center requirements. The load break oil switches may be manually operated or fitted with operating mechanism for automatic transfer of feeder circuits, as illustrated.

For further information, write us or our nearest representative.

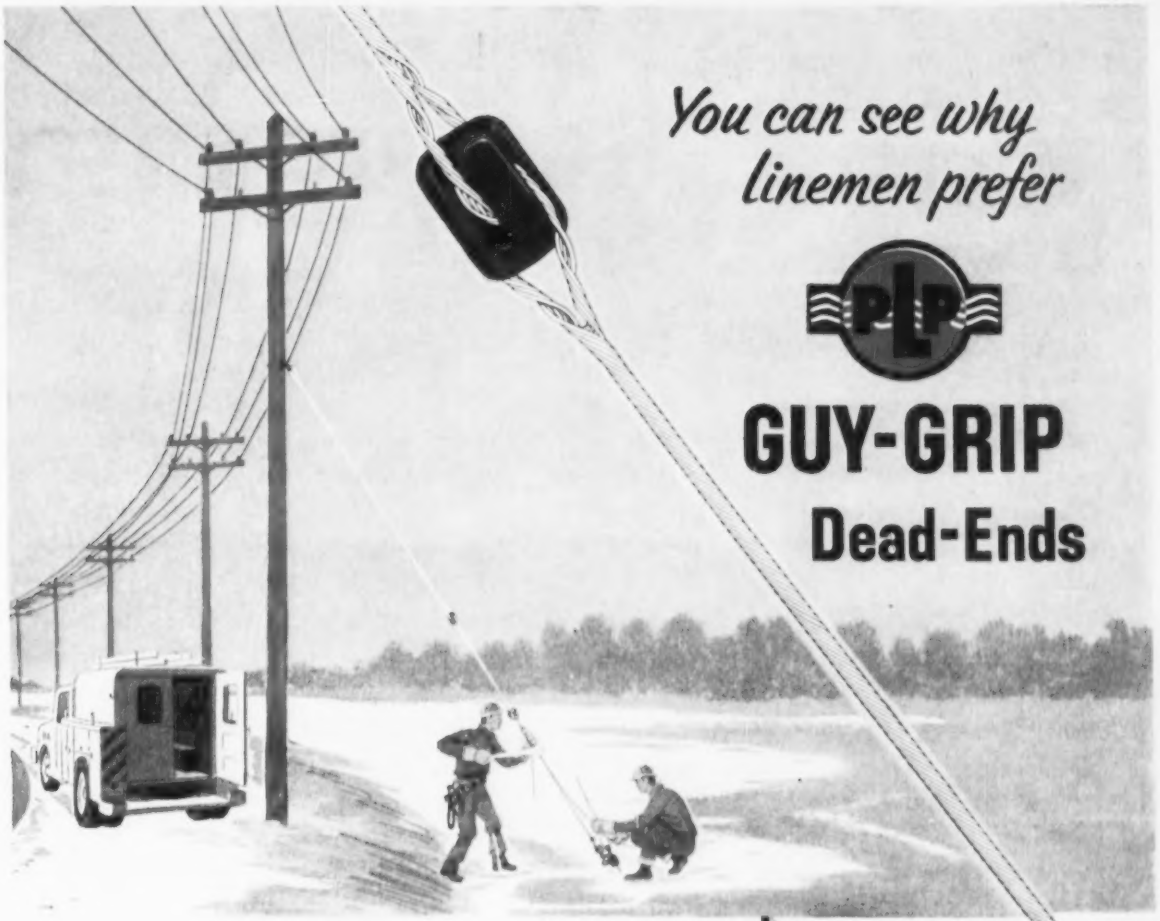
G & W ELECTRIC SPECIALTY COMPANY
3500 W. 127th ST., BLUE ISLAND, ILLINOIS

CD572 Representatives in many cities of U. S. A., N. & S. America Canadian Mfr. — Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

G&W

High Voltage Cable Terminating, Sectionalizing, Protecting, and Connecting Devices

POTHEADS • BOXES • OIL FUSE CUTOUTS • LOAD BREAK OIL SWITCHES • SPLICING KITS



You can see why linemen prefer

PLP

GUY-GRIP Dead-Ends

Linemen are enthusiastic!

PLP GUY-GRIP dead-ends are the easiest, fastest and safest method yet devised for dead-ending strand.

Installation is easy because it takes just one unit, no moveable parts, no bolts or clamps to tighten. It's fast. All you do is hand-wrap the dead-end legs around the strand.

And it's safe. You can see at a glance that the installation is completed and thus secure. Linemen make better time, take pride in their work.
Dept. No. PR4C

PX-81

PREFORMED LINE PRODUCTS CO.
5349 ST. CLAIR AVE. • CLEVELAND 3, OHIO
TELEPHONE CLEVELAND EXpress 1-3521

Made in accordance with or for use under U. S. Patent No. 2,761,273; other patents issued and pending.

A fact for every electric utility

FROM COLD RESERVE TO FULL LOAD IN 60 SECONDS

Impossible? Not at all. For this is a characteristic of Electro-Mobile Power. From a cold start a 1000 kw unit can deliver its full load *in less than sixty seconds.*

This is true of one or one-hundred units, 1000 kw or 100,000 kw—steady full-load power in far less time than required by any other prime mover, except a spinning unit.

But spinning reserve is *costly* reserve. By letting Electro-Mobile Power supply reserve requirements you not only eliminate running losses, but investment per kilowatt is lower. Efficiency of present stations will improve, too, because generators can be run at a higher load factor.

Further, by placing Electro-Mobile Power at the points of load, transmission loss is reduced and less reserve is required to maintain service. Another advantage: EMP units are available with impulse starting or stopping which permits unattended operation from any location.

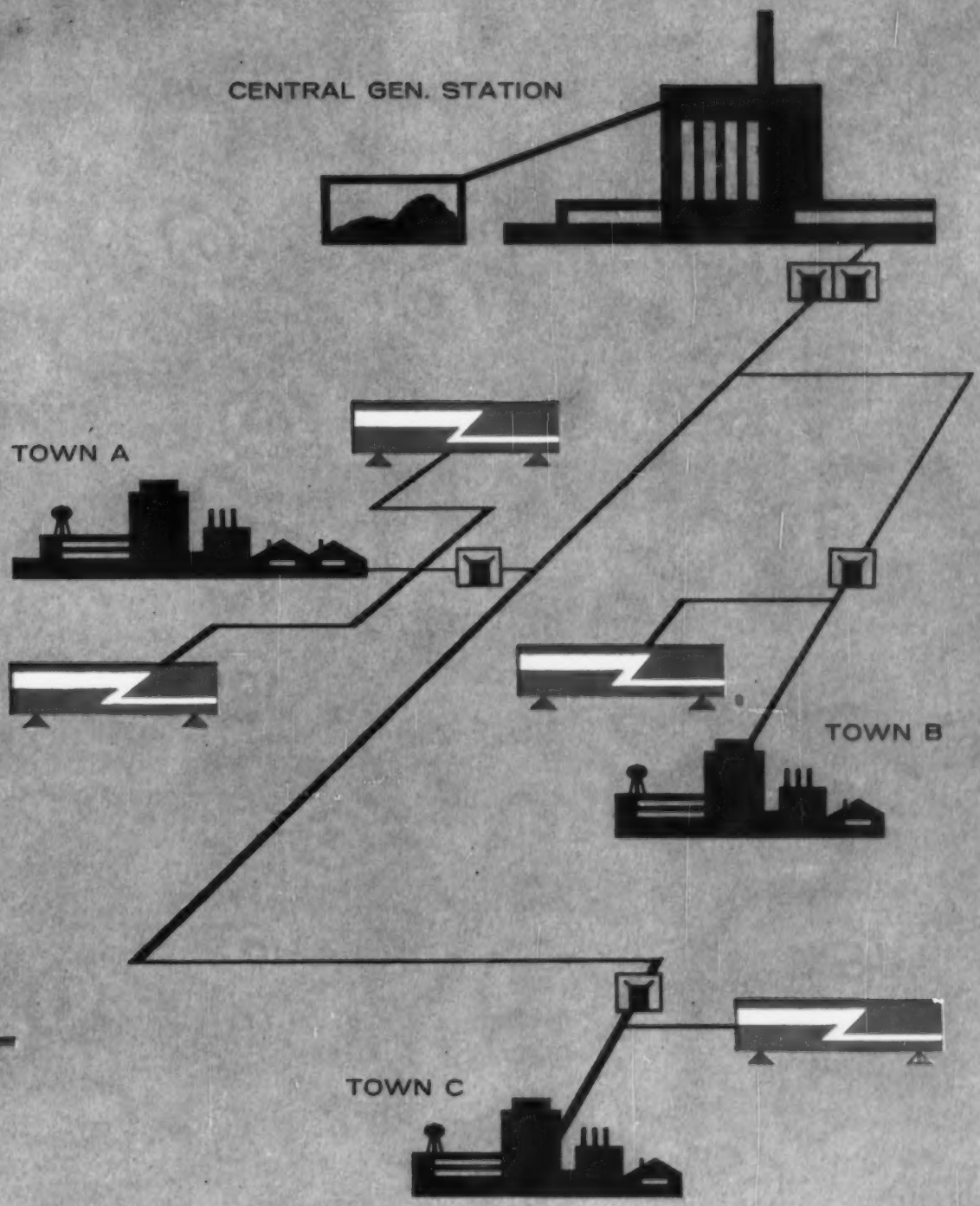
How might a multi-megawatt system of Electro-Mobile Power units apply to your system? We'd like an opportunity to sit down with your engineers and discuss it. Contact your Electro-Motive representative, he has the details.

Increased demand of 5000 kw at central station picked up in less than 60 seconds by four 1000 kw Electro-Mobile units.

RAIL CAR—1000 kw units for use on sidings or placed on piers for semi-permanent use.

TRUCK TRAILER—500 kw units offer excellent mobility for many temporary applications.

This simple diagram suggests how Electro-Mobile Power located at points of load can effectively reduce reserve requirements and costs. Assuming a 1000 kw line loss at time of peak from the central station, only four 1000 kw EMP units are needed to pick up a 5000 kw demand. Naturally, line loss will vary according to the make-up of the system. However, an analysis of your peak line losses will show what savings can be expected.



ELECTRO-MOTIVE DIVISION
GENERAL MOTORS LA GRANGE, ILLINOIS
Sales Offices in Chicago, New York, St. Louis, San Francisco

MEN RESPONSIBLE FOR

POWER DISTRIBUTION KNOW...

IF IT'S PARANITE IT'S RIGHT!®

From Power to Control Cable . . .

Cable specified for utility applications must provide dependable performance to the highest degree. That's why more and more engineers are saying—If It's Paranite It's Right!® Paranite cable is engineered to perform in excess of your most rigid requirements. Super-Pararite® butyl rubber insulations have been developed to withstand special conditions in your area. Copper or aluminum bare or weatherproof cables—ACSR or line wire (formerly products of Midland Wire Corporation) are available.

LIVE BETTER ELECTRICALLY

PARANITE WIRE AND CABLE

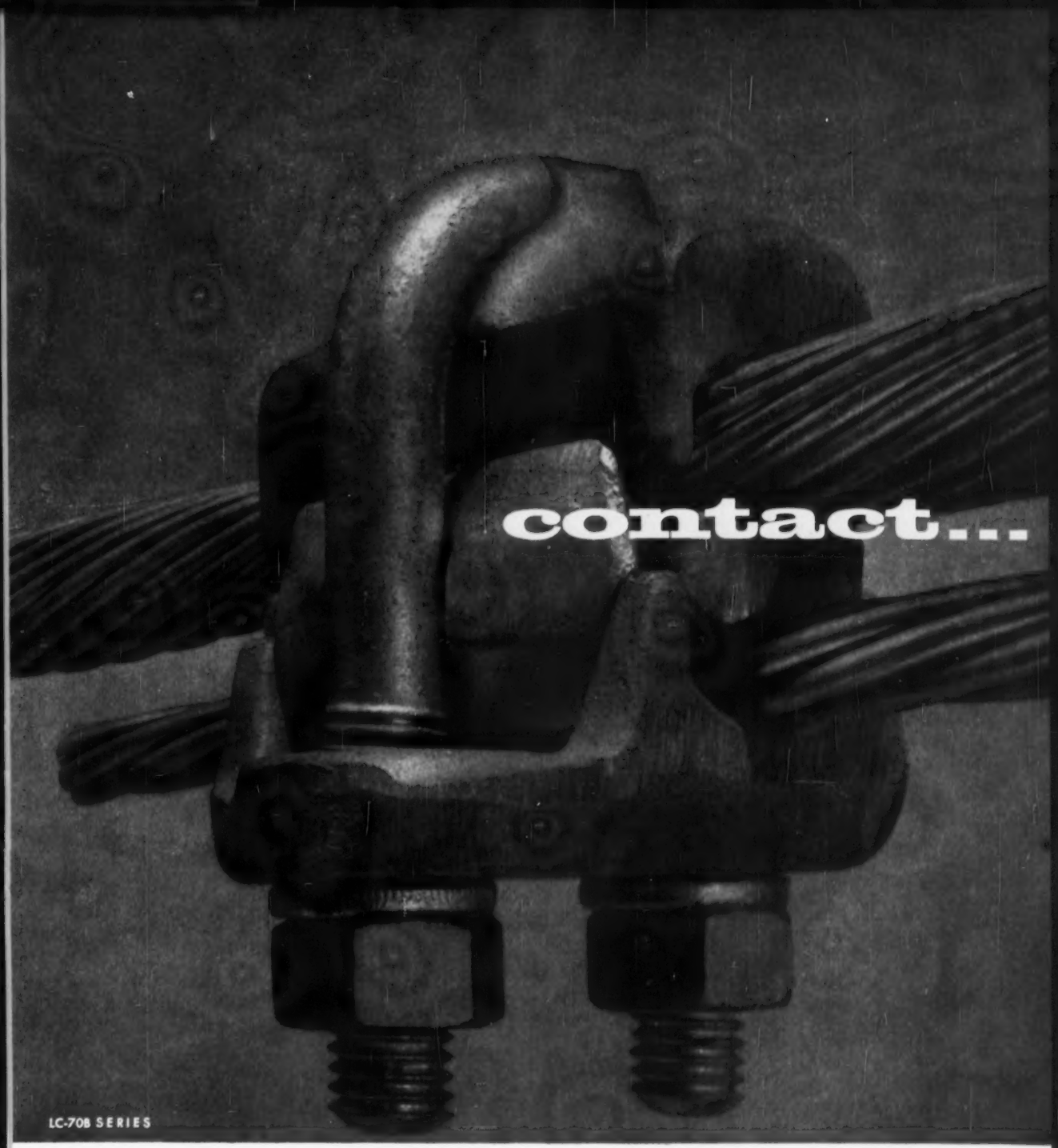
DIVISION ESSEX WIRE CORPORATION

Factory: Anaheim, California

WAREHOUSES* AND SALES OFFICES

*LOS ANGELES, 6415 East Fleet Street; *SAN FRANCISCO, 1077 Howard Street;

*PORTLAND, 525 North Tillamook Street

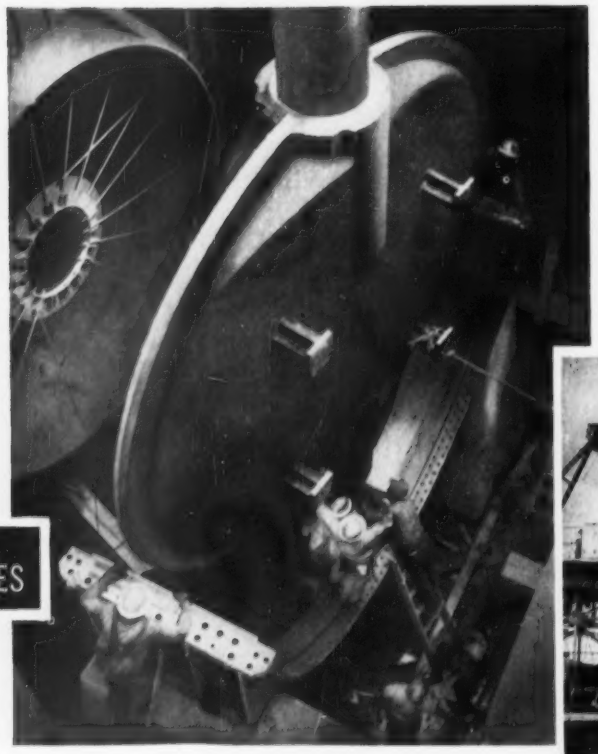


ANDERSON ELECTRIC

Performance at Point-of-Contact is what counts! Anderson Electric's new U-bolt aluminum parallel groove connector with COVER ALL spacer . . . maintains cable configuration . . . speeds installation . . . provides more area contact . . . increases range . . . increases pull-out strength . . . assures inhibitor protection.

ANDERSON ELECTRIC CORPORATION
Birmingham 1, Alabama

Aluminum & Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATIONS • TRANSMISSION • DISTRIBUTION



An 18' butterfly valve disc is shown here during installation at Blakely Mountain in Arkansas. Note the streamlining of the welded disc.

Photos – Vicksburg District, Corps of Engineers

SMS
BUTTERFLY VALVES

SMS VALVE SEALS CUT LEAKAGE TO MINIMUM

SMS Butterfly Valve seals cut leakage to a minimum. Disc seals are adjustable from either inside or outside, whichever is specified. Specially-developed SMS trunnion seals are essentially drop-tight.

With inside adjustment, the disc may be seated directly on the plate steel housing, as at Blakely Mountain, illustrated above, and as at Fort Peck, Montana. Here a 16 ft. dia. valve, recently tested after 14 years of service, had *less than ½ gpm leakage.*

SMS welded discs and housings assure greater freedom from the material defects of castings and permit more economical construction. The photo illustrates the streamlining possible with welded steel plate construction. This holds head losses and turbulence to a minimum.

SMS has designed and built butterfly valves in diameters from 3 inches to 18 feet, for service with operating heads up to 750 feet. For the assurance that your hydraulic equipment will meet or exceed specifications, you can rely on over three-quarters of a century of experience that SMS offers. For full information on butterfly valves, hydraulic turbines and accessories, write S. Morgan Smith Company, York, Pennsylvania.

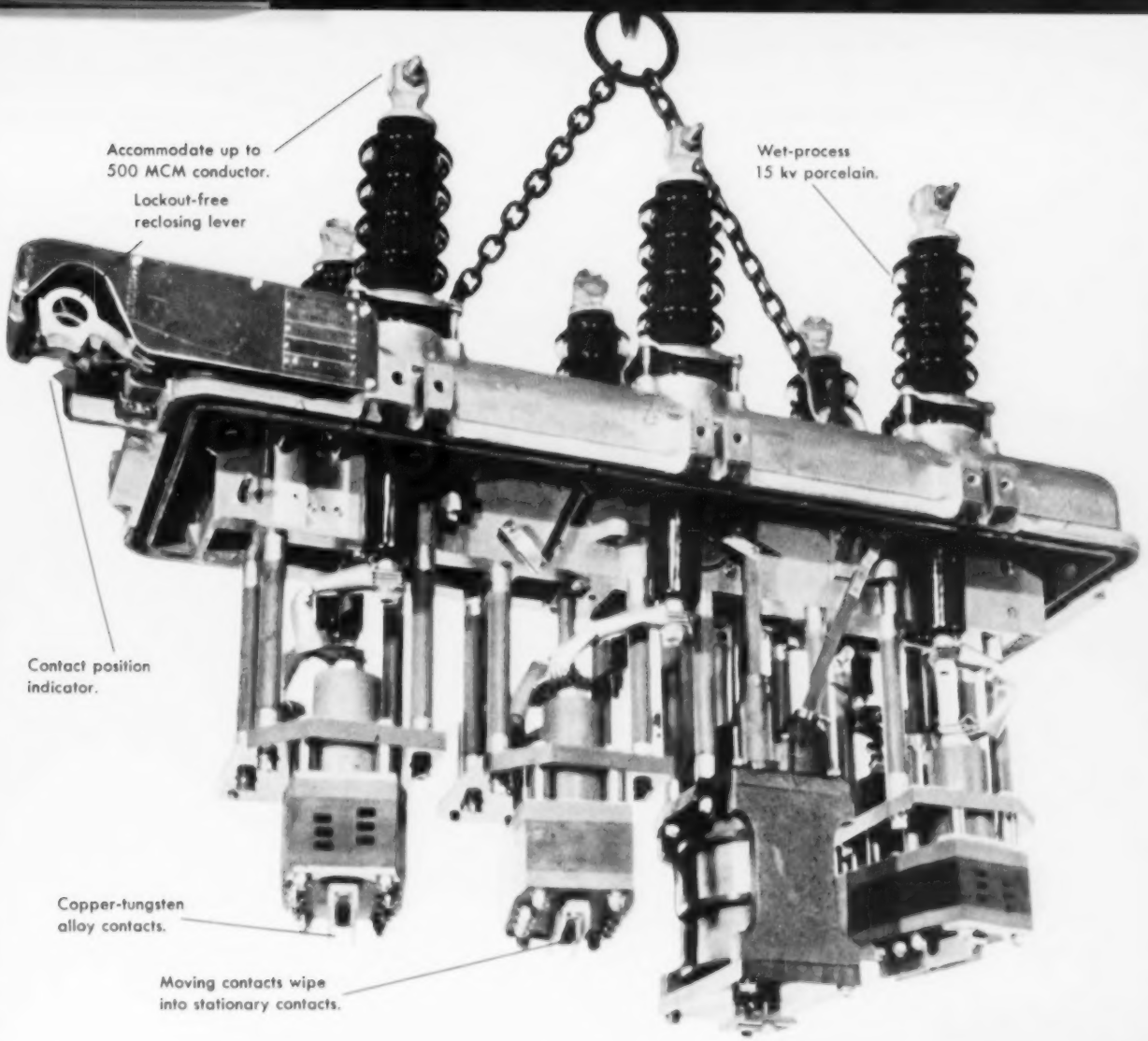
Hydraulic Turbines
Pumps
Gates & Hoists
Trash Rakes
Accessories

HYDRODYNAMICS

Rotovalves
Ball Valves
Butterfly Valves
Free-Discharge Valves
Controllable-Pitch Ship Propellers

S. MORGAN SMITH CO.

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO


Accommodate up to 500 MCM conductor.
Lockout-free reclosing lever
Wet-process 15 kv porcelain.
Contact position indicator.
Copper-tungsten alloy contacts.
Moving contacts wipe into stationary contacts.

Time-current characteristics and operating sequences can be easily adjusted in the field.

Moving contact speed during separation is varied hydraulically so the contacts pause in the opening operation to permit arc extinction. This eliminates arc elongation and excessive interrupter erosion.

Contacts and arc interrupter structure utilize the snap toggle contact action and cross-blast arc extinction principle.

Sequences can be easily adjusted for 2, 3, or 4 operations to lockout in any combination of operations.

L-M's Kyle Type W, Heavy-Duty, 3-Phase Recloser 14.4 KV, 110 KV BIL, 560 Amp. Max. Load Rating. Fast 2-Cycle Clearing Time.

New Type W Recloser Is a Power Class III Unit

(Proposed NEMA Standard)

Heavy Duty Cycle Rating	
No. of Operations	Percent of Inter. Rating
24	15-20%
16	45-55
12	90-100
52	15-100%

Load Ratings Amperes	High Interrupting Rating* Symmetrical RMS Amperes at Maximum Phase-to-Phase Nominal Voltage of:		
	2.4 to 4.8 kv	4.8 to 8.32 kv	8.32 to 14.4 kv
100	6000	6000	6000
140	8400	8400	8000
160	9600	9600	8000
185	11100	10000	8000
225	12000	10000	8000
280	12000	10000	8000
400†	12000	10000	8000
560†	12000	10000	8000

*For applications where X/R ratio does not exceed 14. 110 kv BIL.

†Available with minimum tripping current of both 160% and 200% of load rating

Industries Kyle® Reclosers

McGRAW EDISON

L-M Offers Complete Line of Accessories to Supplement Series Over-Current Tripping

L-M's new Type W recloser provides accurate and dependable series over-current protection as a self-contained device. In addition, L-M offers a complete line of auxiliary equipment to provide almost any supplementary relaying scheme.

Ground Fault Relaying

L-M's new Type TW current transformer is used in conjunction with a ground trip solenoid to provide ground fault relaying, current metering, or both. The transformer consists of three single-phase units mounted in a single oil-filled tank. Ground fault relaying is accomplished by paralleling the TW secondaries of ground fault sensing. The unit can be mounted on the Type W recloser frame.

The Ground Trip Solenoid mechanism operates the recloser when it is energized by an unbalanced current from the paralleled secondaries of the current transformer. The solenoid mechanism provides its own dual time-current characteristics. The number of fast operations can vary from 0 to 4. The solenoid mechanism is mounted inside the recloser.

Other Relay Schemes

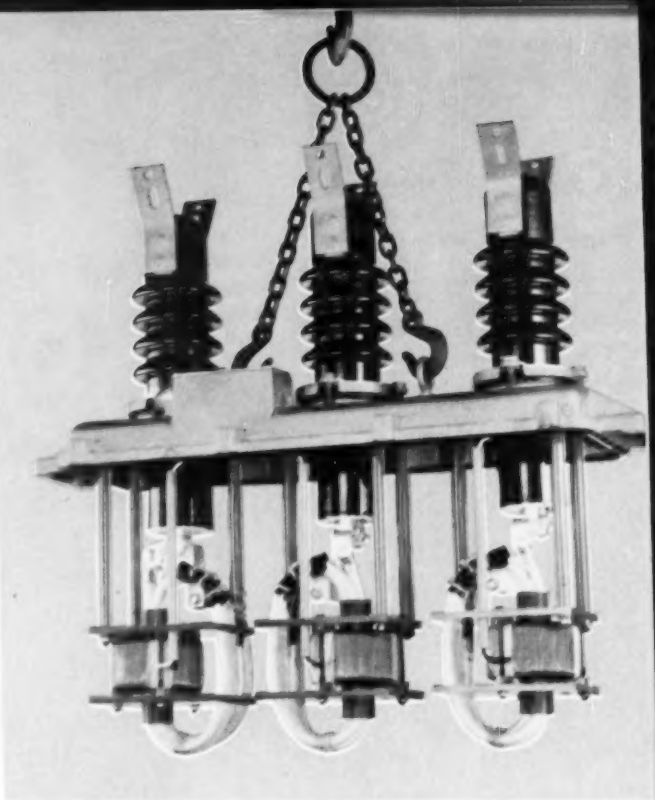
The Shunt Trip Solenoid mechanism is a tripping device only, designed to operate the recloser when energized from a supplementary relay scheme. When the solenoid is energized, the recloser starts operations to lockout just as in normal series tripping.

Shunt Lockout and Shunt Closing Solenoid mechanisms operate by remote control to trip the recloser and hold the contacts open to lockout and also to close the contacts by remote control.

Shunt Blocking mechanism is also available to prevent reclosing. The mechanism is controlled by a remote voltage source.

Auxiliary Switch provides positions for remote-control indication or low-voltage control switching of apparatus used in conjunction with the Type W recloser.

L M engineers will help you design protective and switching schemes to best fit your system. In the photo are, left to right, Jay Wagner, Frank McStay, Wayne Wiechmann, and Lyle McNulty of Line Material working on a ground trip relaying scheme.



L-M's new 3-phase Type TW current transformer has a rated primary current of 400 amps., and insulation level of 14.4 kv, 110 kv BIL with current ratios of 600:5, 400:5 and 200:5. Primaries are connected one in each phase through coaxial bushings, and secondaries are in parallel.

Application Engineering Service

Line Material application engineers are experienced in the design and operation of protective and switching schemes for transmission and distributing systems. L-M engineers will cooperate with you in working out the most satisfactory schemes for your system. L-M will supply schematic circuit diagrams, time-current curves and control or switching schemes for any combination of current, voltage and time-delay relaying.

Get Complete Information

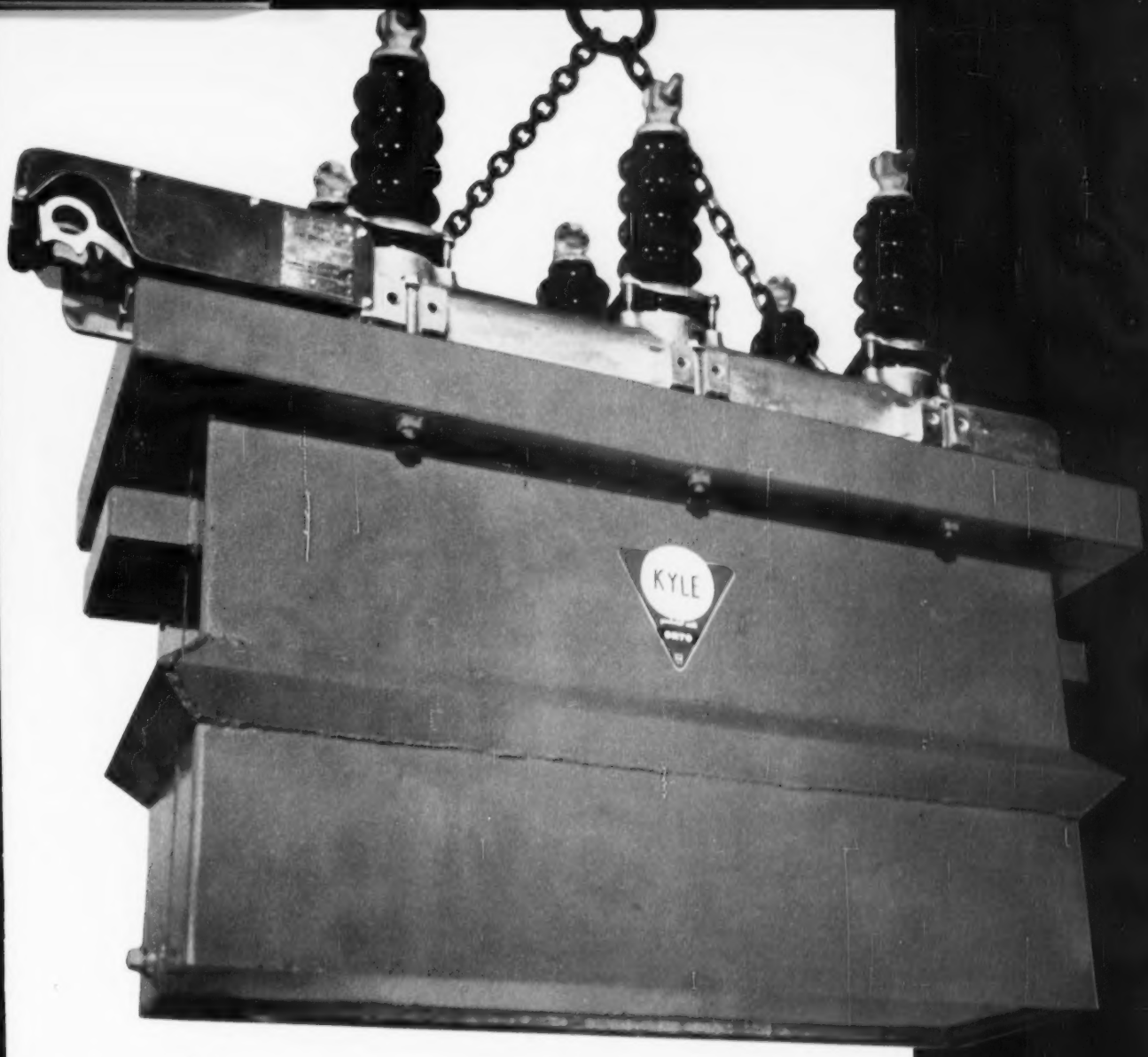
Ask the L-M Field Engineer for more information on how L-M's new Type W recloser can be profitably applied to your system. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

Kyle® Reclosers

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

McGRAW EDISON



New! **200 MVA interrupting rating for $2,478**

Fast 2-Cycle Type W Recloser For Substation Application

L-M's new heavy-duty Type W recloser offers the greatest advance in system protection in the past 20 years—*high-speed, 2-cycle clearing of substation feeder circuits.* Advantages include closer coordination with fuses, larger substation transformer capacity without increasing wire size of the circuits, and minimum conductor burndown and outages due to non-persistent causes.

The Type W recloser also offers large savings in initial investment and maintenance, and it costs less than half as much as a circuit breaker used as the feeder disconnecting device in substations.

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

Here's How

L-M's Fast 2-Cycle 200 MVA Recloser Provides Greater Service Continuity

- minimizes conductor damage and burndown
- offers closer fuse coordination, cuts fuse outages
- permits increasing substation capacity
- cost is approximately half that of OCB's

By **FRANK McSTAY**, Product Manager, Kyle Products, Line Material Industries

Now for the first time, here is economical substation equipment that will operate fast enough to prevent conductor burndown resulting from transient or non-persistent causes.

Fast 2-Cycle Clearing

The high-speed, 2-cycle clearing of L-M's 200 MVA Type W recloser is approximately four times as fast as the total clearing time of most modern distribution oil circuit breakers. Up to 90% of transient faults can be cleared with no significant damage to the conductor or interruption of service continuity.

High-speed clearing also provides better fuse coordination, and trouble is confined to smaller areas.

360% Greater Conductor Protection

The importance of providing fast clearing time increases with the fault current. For example, consider a No. 1/0 standard conductor and a total clearing time of 12 cycles (standard for 8-cycle OCB's plus relays), compared with 2 cycles for L-M's high-speed Type W recloser.

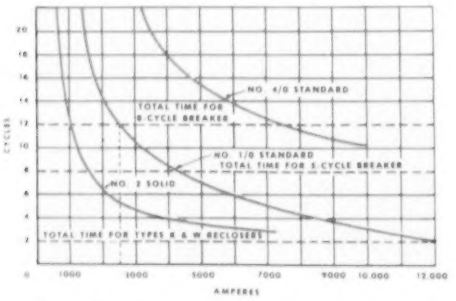


Chart shows average primary line burndown characteristics for standard weatherproof conductor. It also gives maximum clearing time for L-M's high speed Type W recloser and minimum clearing time for the average oil circuit breaker plus relay time, showing the far greater protection against burndown provided by the Type W.

As the chart shows, with a 12-cycle OCB a No. 1/0 conductor will burn down at approximately 2,600 amperes. But with the 2-cycle Type W recloser, this conductor can take up to 12,000 amperes. L-M's Type W recloser would therefore protect the No. 1/0 conductor for approximately 360% of the maximum fault current for which the breaker would offer protection.

380% Greater Substation Capacity

Reducing the duration of fault-current flow with L-M's Type W recloser offers the opportunity to increase transformer capacity without increasing the wire size of the system or necessitating reactors to limit the available fault current.

If we again compare the burndown characteristics of a No. 1/0 conductor for a standard 8-cycle OCB and L-M's Type W on the chart, you will recall they protect the No. 1/0 conductor up to fault currents of 2,600 amperes and 12,000 amperes respectively. This means that if we assume an infinite primary bus, and the same percent transformer impedance, the transformer KVA at the substation can be increased 380% using the Type W recloser, without losing burndown protection for the No. 1/0 conductor.

Equivalent protection with reactors would require a capital investment estimated at $7,000 to $8,000, plus additional maintenance and substation space. Reactors would also introduce additional losses.

Fast Reclosing

L-M's Type W recloser has fast (25-cycle) reclosing to provide protection against rapidly recurring faults such as multiple strokes of lightning. This is accomplished on the Type W without derating the unit.

200 MVA Recloser for $2,478

The Type W is a 3-phase recloser, completely automatic and self-contained. Series over-current tripping is available with a selection of three time-current characteristics—fast, retarded, and extra retarded.

The initial investment in L-M's Type W recloser equipment compares most favorably with both the 100 MVA OCB for applications at low voltages and 250 MVA OCB at 14.4 kv, 110 kv BIL. The $2,478 price of the basic unit is about half as much as that of the OCB.

In addition, field reports indicate that the labor cost of installing the new high-speed Type W recloser is about half that of oil circuit breakers. And the maintenance cost for reclosers is also lower than for oil circuit breakers.

LINE MATERIAL

McGRAW-EDISON COMPANY

1945

THE FIRST . . . FISHER-PIERCE PHOTOELECTRIC LIGHTING CONTROL

. . . THE LATEST

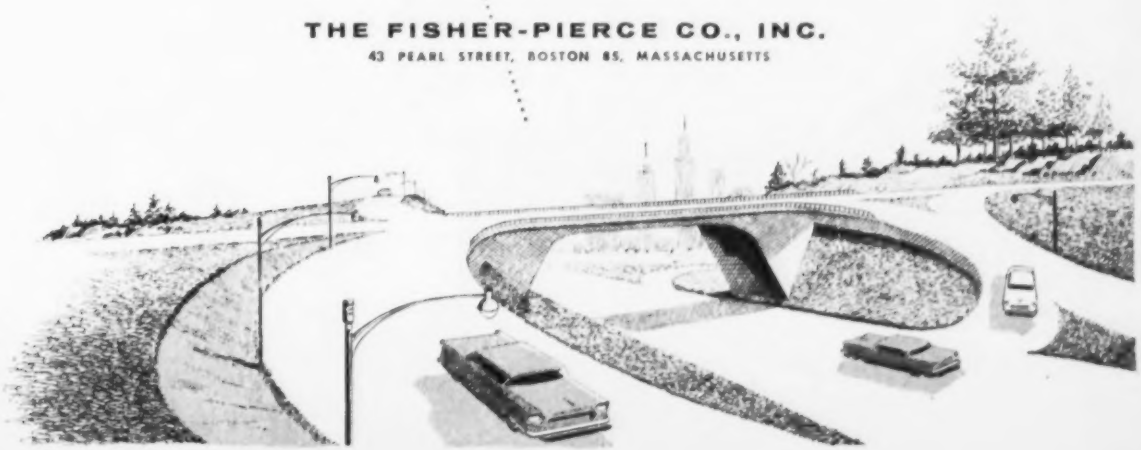
1957

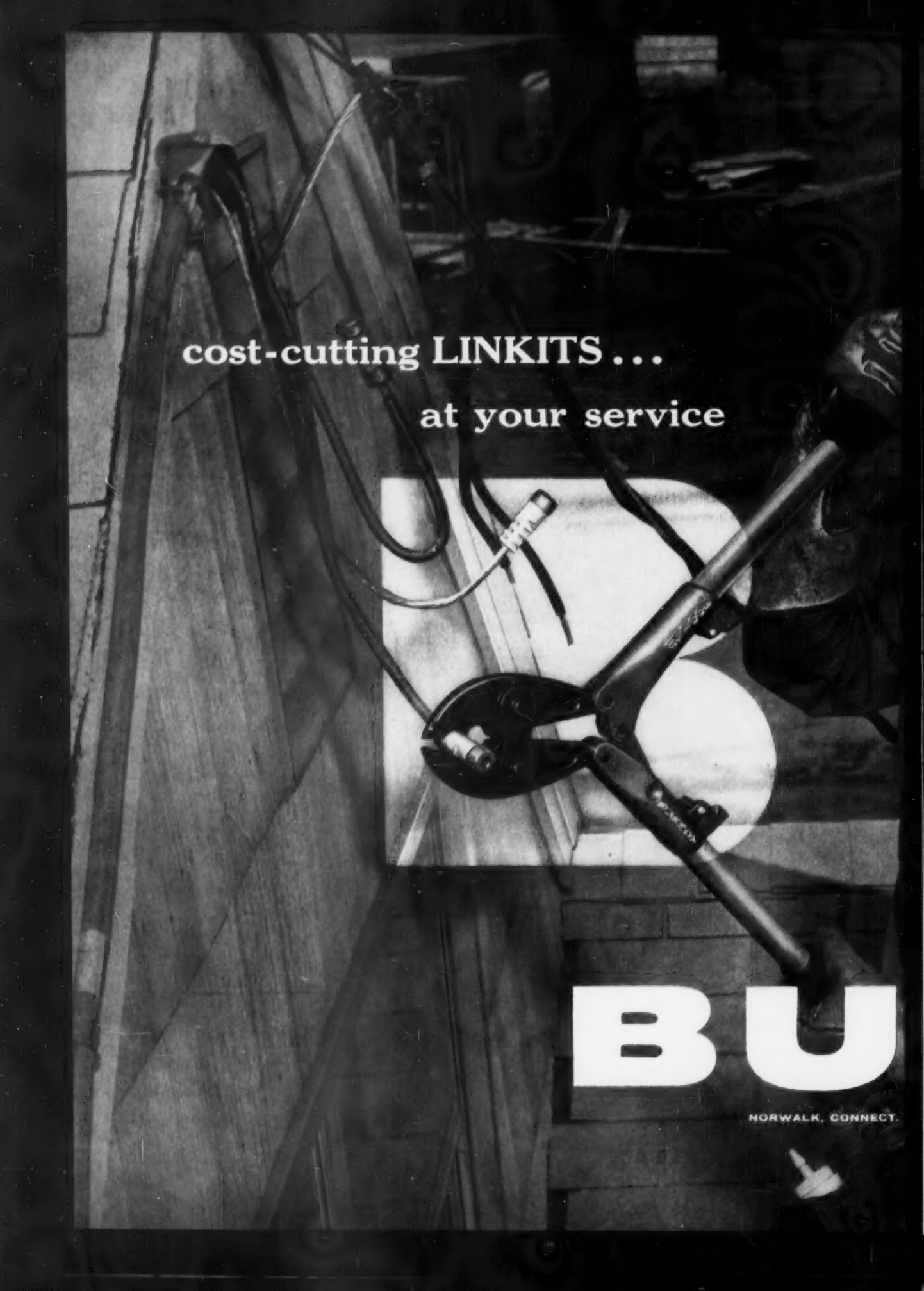
The year World War II ended, The Fisher-Pierce Company began work with utility engineers to develop photoelectric controls. Automatic, dependable switching of street lighting circuits when illumination was needed, regardless of time of day, season or weather, was the fundamental idea. The Series 61300 was the first of five different, major groups of F-P controls that have followed.

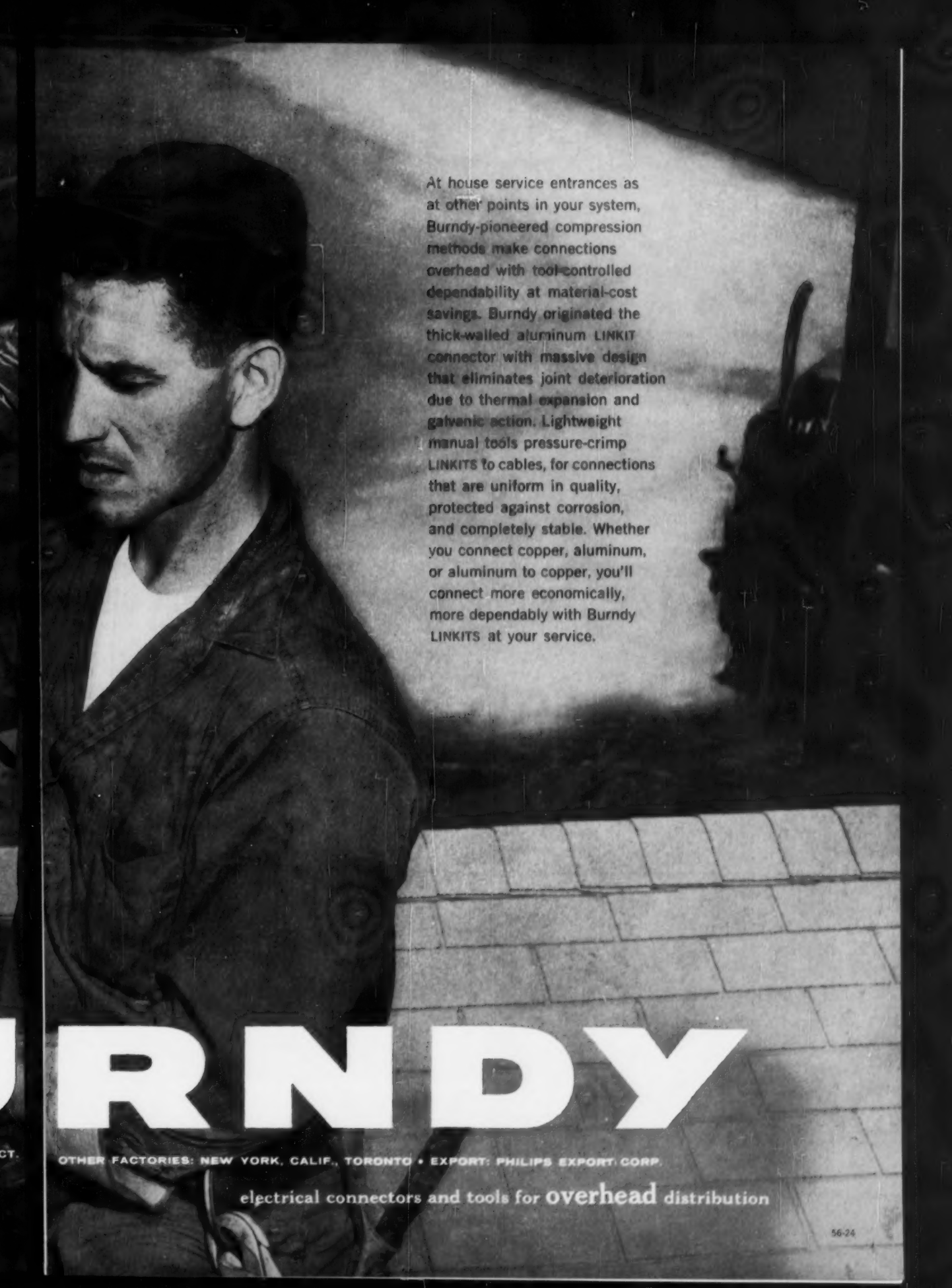
The experience has proved valuable to Fisher-Pierce and customers alike. Backed by an organization of more than 650 people, F-P today offers photoelectric lighting controls for all purposes . . . extensive sales and engineering services . . . research, development and production facilities to solve specific photoelectric/electronic equipment problems you may have. Your inquiry about F-P products, who uses them, and how you may use our development facilities for your own electronic equipment requirements, is welcomed.

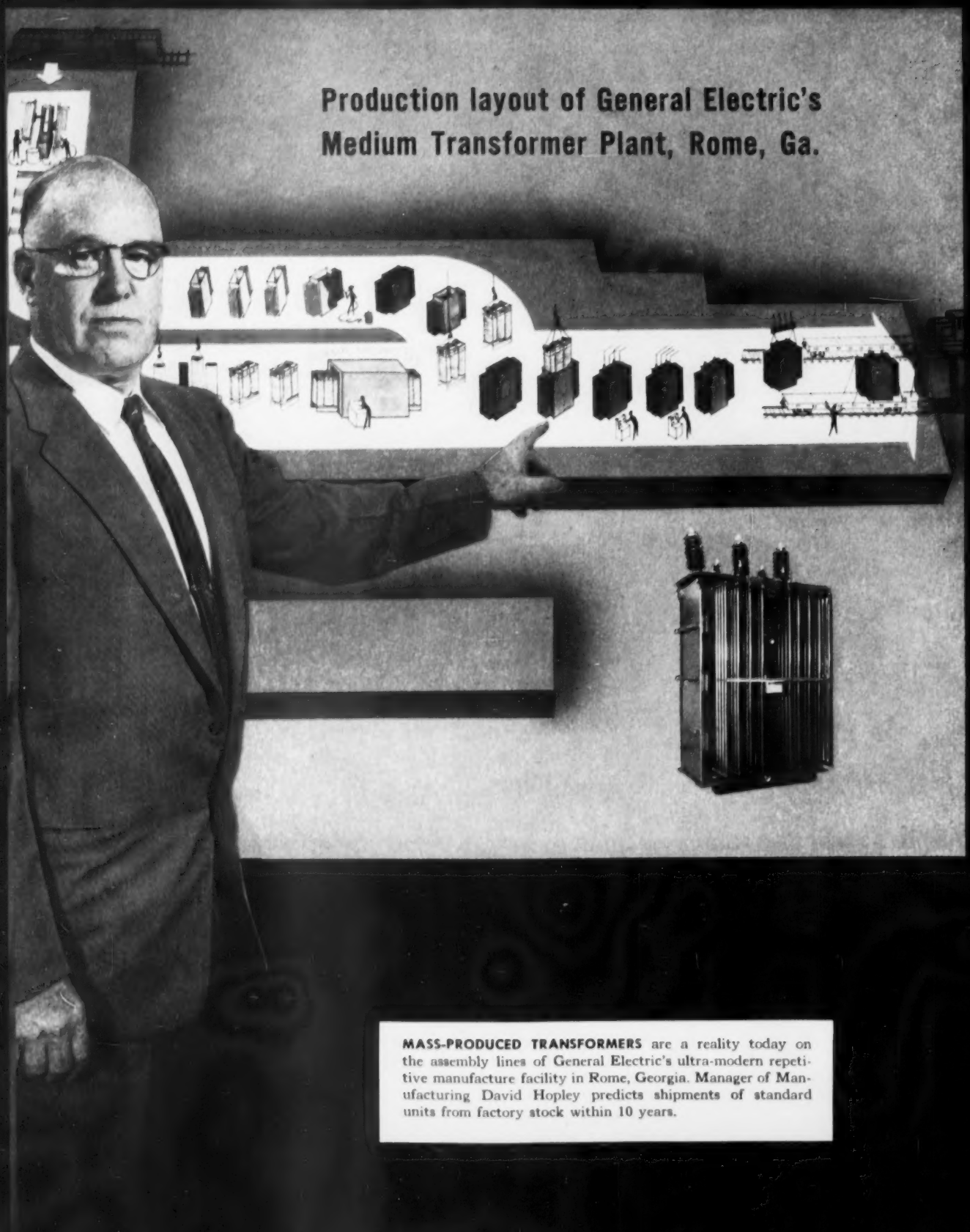
THE FISHER-PIERCE CO., INC.

43 PEARL STREET, BOSTON 85, MASSACHUSETTS




cost-cutting LINKITS . . .
at your service
BU
NORWALK, CONNECT.


At house service entrances as at other points in your system, Burndy-pioneered compression methods make connections overhead with tool-controlled dependability at material-cost savings. Burndy originated the thick-walled aluminum LINKIT connector with massive design that eliminates joint deterioration due to thermal expansion and galvanic action. Lightweight manual tools pressure-crimp LINKITS to cables, for connections that are uniform in quality, protected against corrosion, and completely stable. Whether you connect copper, aluminum, or aluminum to copper, you'll connect more economically, more dependably with Burndy LINKITS at your service.
URNDY
OTHER FACTORIES: NEW YORK, CALIF., TORONTO • EXPORT: PHILIPS EXPORT CORP.
electrical connectors and tools for overhead distribution
56-24



MASS-PRODUCED TRANSFORMERS are a reality today on the assembly lines of General Electric's ultra-modern repetitive manufacture facility in Rome, Georgia. Manager of Manufacturing David Hopley predicts shipments of standard units from factory stock within 10 years.

A GENERAL ELECTRIC 10-YEAR FORECAST:

"Off-the-shelf" delivery of standard-design, automation-produced medium transformers

In 1967, electric utilities will be able to buy standard-design medium transformers direct from manufacturers' stock. This will permit immediate satisfaction of emergency load demands as well as shorter planning cycles for normal load growth. So forecasts David Hopley, manager of manufacturing at General Electric's Medium Transformer Department in Rome, Georgia.

This tremendous reduction in delivery time (from the present 10 weeks for standards, and up to 16 weeks and more for specials) depends on continuing the utilities' established trend to standard transformers. For, as acceptance of standard-design units grows, manufacturers are able to move toward automated production of "stock" medium transformers.

For instance, repetitive manufacture facilities at G.E.'s $25,000,000 Rome, Georgia, plant already have helped halve delivery time of medium transformers in the past 10 years.

YOU GET REAL BENEFITS *TODAY!*

During the transition period leading to entire systems of standard-design transformers, electric utilities are enjoying current benefits from General Electric medium transformers. For example:

Lower price—Standardization of design results in an 8% saving in price on General Electric RM (Repetitive Manufacture) medium transformers.

More and better features—Standard design makes it economically possible for G.E. to offer such extras as Formex* insulated windings, control-center arrangement of instruments and accessories, reversible junction boxes, and many others.

Higher quality for longer life—G-E repetitive manufacture techniques permit 18 assembly-line tests and 22 quality-control inspections during manufacture, to assure dependable operation over a long service life.

G.E.'S BROAD RANGE OF STANDARDS HANDLES 90% OF ALL JOBS

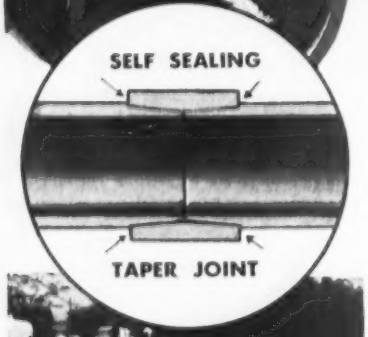
If your company is not yet taking full advantage of the large dollar savings and other key benefits of medium transformer standardization, act today. Ask your G-E Apparatus Sales Engineer to show you how G.E.'s broad range of standard RM medium transformers can meet the large bulk of your needs, and also work efficiently with older, special transformers now on your system. General Electric Co., Schenectady, N. Y. 416-10

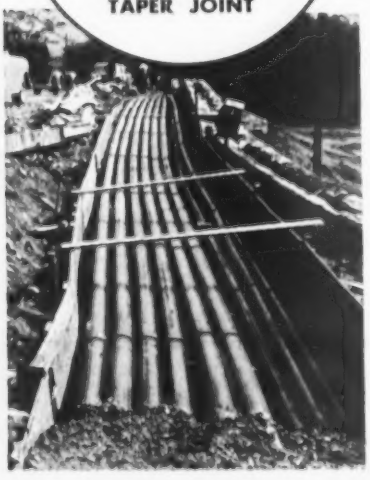
*Reg. Trade-mark of General Electric Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC

SMOOTH BORE!





Orangeburg Fibre Conduit Prolongs Cable Life

Protect cable sheath from abrasion and you prolong the life of underground cables, say utility engineers. Scoring of cable sheath creates "trouble spots" that shorten cable life.

That's where Orangeburg Fibre Conduit plays an important part in keeping cables healthy. Orangeburg's smooth bore, its low coefficient of friction minimize the danger of abrasion when cables are pulled in, as well as later on during cable movement. By protecting cable sheath from abrasion, Orangeburg Fibre Conduit adds years to cable life.

Orangeburg's impermeable wall and watertight joints protect cables from corrosive ground waters. Its nonmetallic material is strong, tough, resilient, long lasting.

And, remember, Orangeburg lays faster and at lower cost than other types of conduit. It is light in weight, easy to handle, easy to tool on the job. Spacers, bends, fittings, 5° bend sections and lightweight tapering tool, all combine to simplify installation.

Since 1893, records of long life have proved Orangeburg's durability and economy.

Orangeburg Fibre Conduit is distributed by Graybar Electric Company and General Electric Supply Company with branches and stocks in principal cities.

WRITE DEPT. EW-47 FOR NEW CATALOG 52.

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT

Listen, friends, to the hideous fate of the man who learned about cables too late

Lucius K. Watt was an engineer
He was eager and honest and able,
And one of the things he did for his firm
Was to buy electrical cable.

Now he knew all the people at Okonite
But with orders he'd seldom reward 'em,
"Because," he would state, "the cables are great
But who in the world can afford 'em?"

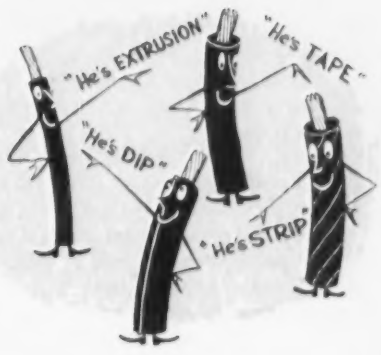
(Now that was a fault of the late Lucius K's—
That he had such a silly illusion;
For Okonite insulates cables *all* ways:
Strip, taping, dip and extrusion.

Only Okonite uses all methods, you see—
Our prices are *not* always highest;
And thus when you ask us what cable to use
Our recommendation's unbiased.)

So Lucius K. Watt went out and he bought
A cable he heard was a bargain
And this was too bad, for Lucius was had . . .
By some Madison Avenue jargon.

The thing was installed (with a minor defect)
In a most inaccessible place;
When Lucius K. Watt went out to inspect . . .
The cable blew up in his face!

We hate to relate this horrible fable
But here is the moral for all:
If you should desire a superior cable—
By extrusion or strip . . . by taping or dip
Just write us a letter, or call.



No matter what insulation or method of application you want (and we use them all) you'll get the best of its kind from Okonite. For a frank, down-to-earth discussion on cable insulating methods, write for Bulletin WE-1106, The Okonite Company, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

4754

KUHLMAN "Salesman of the Week"

If you can identify this Kuhlman Electric Co. representative, and are the first one to notify Dept. SA-1, Kuhlman Electric Co., Bay City, Mich., you will receive a valuable gift certificate. Watch for the next Kuhlman "Salesman of the Week."

"Porcelain enamel will end your corrosion problems . . .

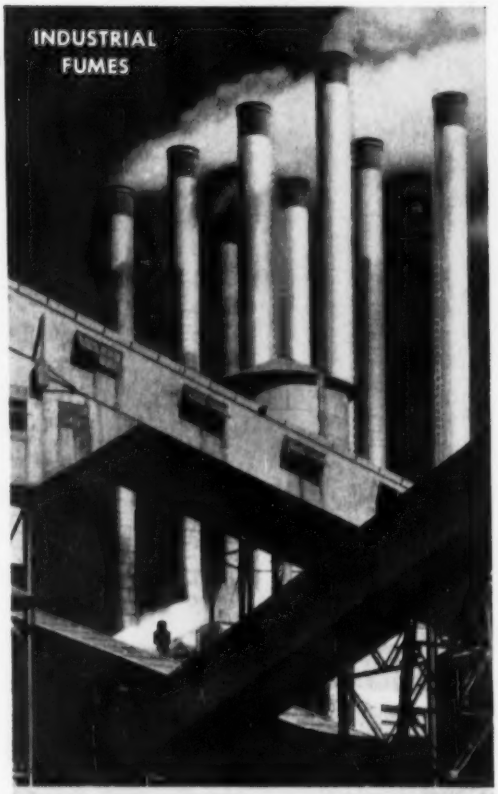
"Many of my customers have proved there is no need for expensive transformer repainting every few years. They changed to Kuhlman porcelain enamel transformers and are licking the problems of industrial fumes or coastal salt spray corrosion.

"Other transformer finishes, with special compounds for increasing protection, only coat the tank surface. In time, severe atmospheric conditions break down the cohesive film of these paints—they begin to flake and corrosion sets in. Now this doesn't happen to porcelain because porcelain frit is *permanently fused* to the tank metal at 1500° F.

"Most engineers agree that you can't beat porcelain for durability. It makes good sense to end your corrosion problems once and for all . . . install Kuhlman porcelain enamel transformers.

"Here's something else—Kuhlman porcelain transformers are equipped with non-corrosive hardware, too . . ."

1. Electrical bronze solderless connector.
2. Increased creep-distance to prevent salt deposit flash-over.
3. Stainless steel bushing clamps.
4. Bronze cover hold down nuts and pressure bar.
5. Bronze hand hole cover nuts.



SALT SPRAY

Whether your corrosion problem is heavy industrial fume or severe salt spray, call in your competent Kuhlman representative for constructive advice.

5710c

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

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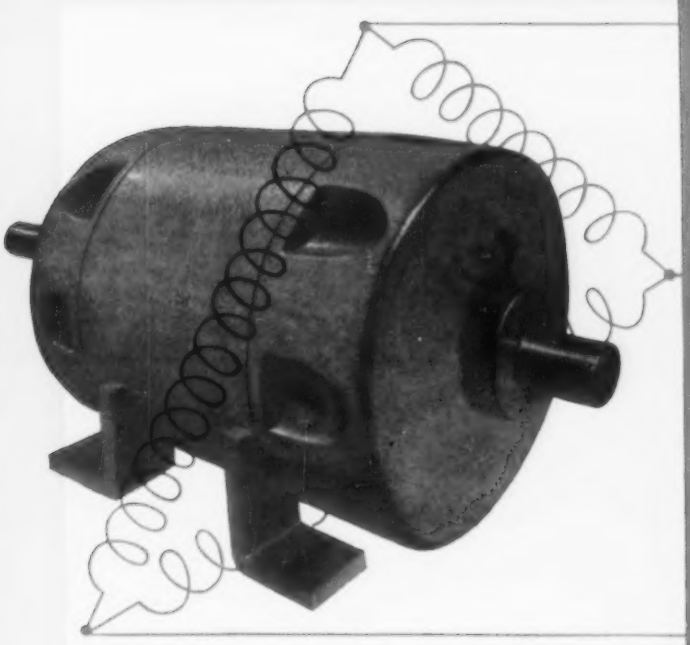


SIMPLE DEPENDABLE protection against phase failure and phase reversal

A-B protector

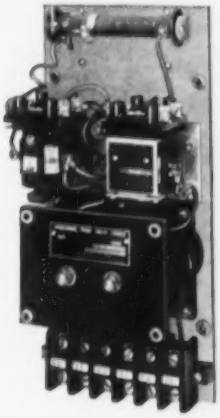
opens control circuit in 3 to 4 cycles...under all load conditions

When men, motors, or the driven machines can be "hurt" by "phase failure" or "phase reversal" . . . the new Allen-Bradley Bulletin 812 should be used as a low cost and reliable "safety" insurance. It detects phase failures and reversals electrically, and within not more than 3 or 4 cycles, opens the motor control circuit—regardless of motor load (including no load)—and thus stops the motor.

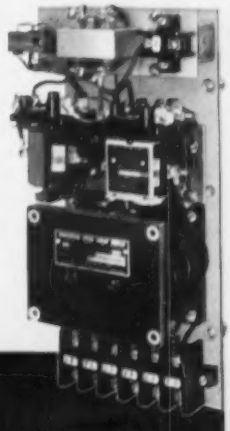
The Bulletin 812 Type A relay protects motors against all phase failures. The Type B relay protects motors against loss of a phase and reversed phase rotation. For the first time, dependable protection is provided for motors supplied by Wye-Delta and Delta-Wye power systems having the neutral ungrounded or not connected to the circuit.

Bulletin 812 relays offer positive protection against motor or machine damage due to opening a primary line—and under all "load" conditions. No field adjustment is required. Remote reset is inherent. Furthermore, as a static device which does not rely for its operation on "motor" revolution the possibility of failure to operate is eliminated.

Bulletin 812 relays are built in four sizes which will reliably protect motors with full load currents from 1.25 amperes to 300 amperes. Let us send you more information about this dependable answer to phase failure and phase reversal problems.



Bulletin 812 Type A phase failure relay protects a 3-phase motor against loss of a phase.



Bulletin 812 Type B phase failure and phase reversal relay protects a 3-phase motor against both loss of a phase and phase reversal.

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QUALITY
MOTOR CONTROL

A-B Quality

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In Canada—
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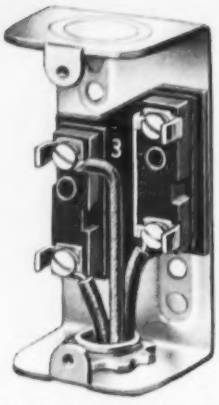
Galt, Ontario

4-57-MR

new Allen-Bradley Bulletin 800 Standard-duty Push Buttons

CAN BE WIRED IN HALF THE TIME!

CONTACT MECHANISM IN THE COVER—COMPLETELY PROTECTED FROM CARELESS SCREWDRIVERS AND CARELESS WIRING.



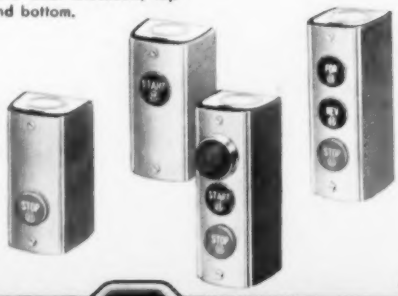
WIRING TERMINALS IN THE BASE —COMPLETELY EXPOSED FOR EASY WIRING.

Here's an entirely new idea in push button stations—a wrap-around cover which contains and protects the contact mechanism. Removing the cover exposes all terminals for instant and easy wiring. Heavy, silver plated contacts connect the push button assembly in the cover with the terminals in the base.

Matching ribs in the cover and notches in the molded terminal base eliminate the possibility of having wiring connections made incorrectly. A molded, bakelite shield protects the contact mechanism and prevents careless wiring from interfering with contact operation. All push button contacts are silver and of the double break construction.

Specify the new Allen-Bradley standard-duty station on your next order. Its installation time-saving feature, alone, should make you a regular customer!

Bulletin 800 standard-duty push buttons—with strong, gray, molded cover are "good-looking" and "safe" in operation. All stations have dual knockouts, top and bottom.



4-57-MR

SELECTOR SWITCH

You can't beat this for convenience—a selector switch with the same easy-to-wire construction as the push buttons, shown above—plus the feature that you can change—*in seconds*—from two position to three position (or vice versa)! The correct name plate is furnished with each switch. See for yourself how easily this is accomplished.

CHANGE IT FROM 2 POSITION TO 3 POSITION (or vice versa)... in 30 Seconds!

A-B Quality

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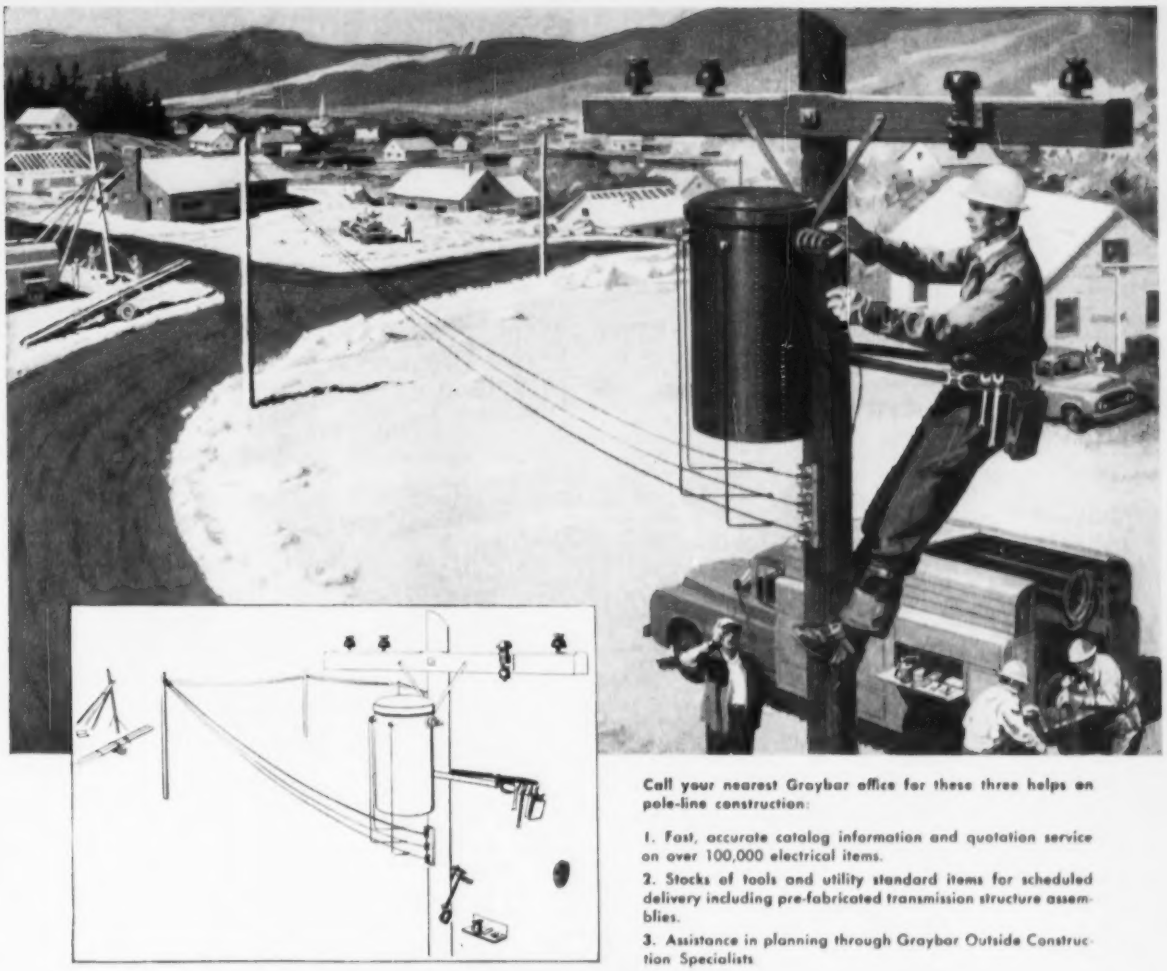

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1. Fast, accurate catalog information and quotation service on over 100,000 electrical items.
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3. Assistance in planning through Graybar Outside Construction Specialists

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As residential areas spread outward from towns and cities and your load demands build up, call on Graybar for maximum help. A telephone call to your nearest Graybar warehouse or office puts our staff to work for you. Whether you're building new lines, adding more feeders or increasing feeder size, Graybar can supply the materials, equipment and supplies you'll need. In emergencies, or for regularly-scheduled shipments, count on prompt deliveries of anything and everything you need for pole-line maintenance and construction . . . via Graybar. 712-84

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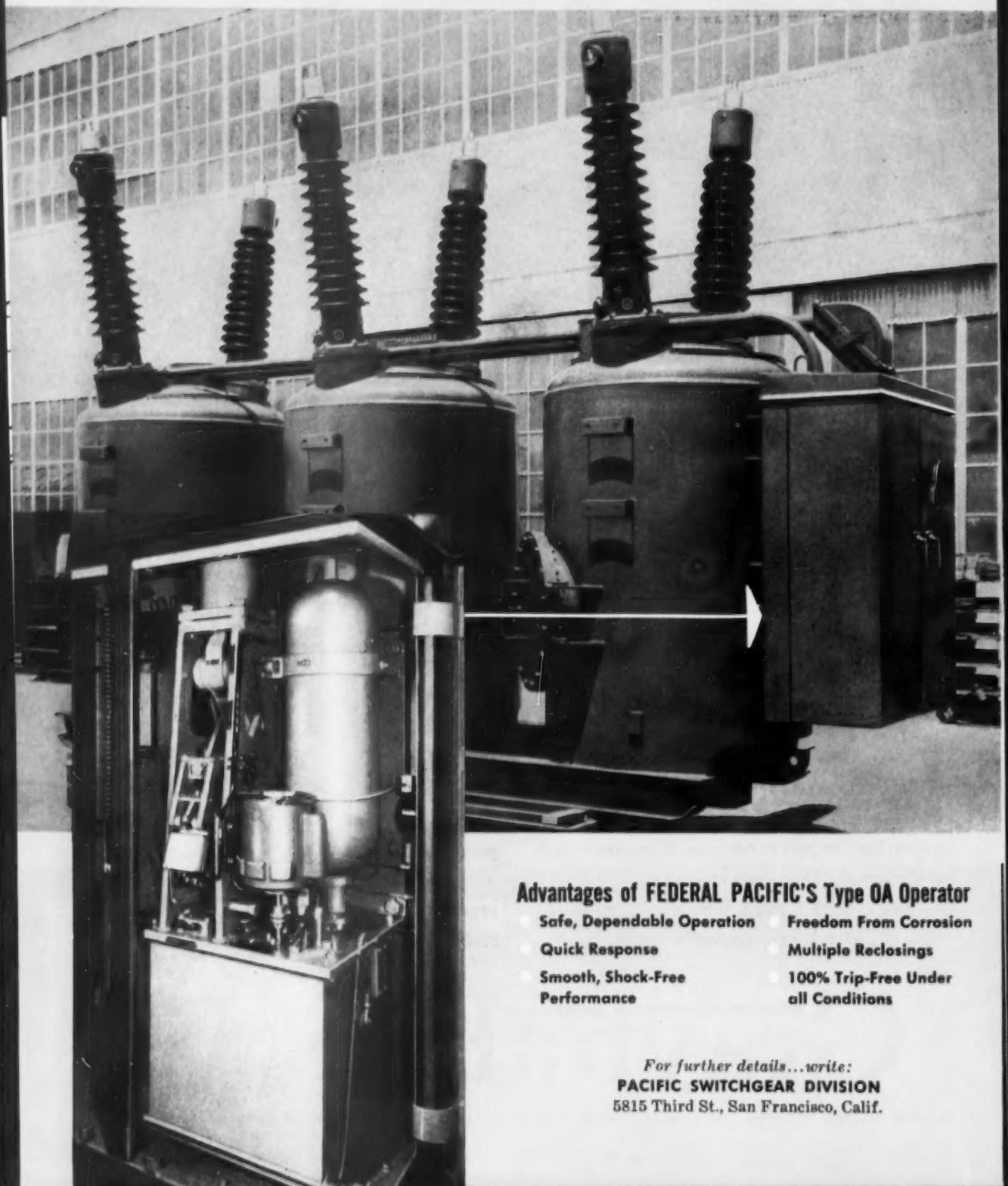
Federal Pacific's

HYDRAULIC



Advantages of FEDERAL PACIFIC'S Type OA Operator

- Safe, Dependable Operation
- Quick Response
- Smooth, Shock-Free Performance
- Freedom From Corrosion
- Multiple Reclosings
- 100% Trip-Free Under all Conditions

For further details...write:

PACIFIC SWITCHGEAR DIVISION

5815 Third St., San Francisco, Calif.

Operating Mechanism

provides smooth, safe, dependable operation under all conditions!

A pioneer in the application of hydraulic principles for more efficient circuit breaker operation—Federal Pacific proved that quicker responsiveness could be obtained and smooth, shock-proof, dependable performance achieved through the use of a *Hydraulic* operating mechanism.

The type OA hydraulic operator, now standard equipment on most Federal Pacific Oil Circuit Breakers, climaxes an extensive development and improvement program in the use of hydraulics over a period of many years.

It is thoroughly tested and proved...and provides maximum freedom from operating trouble while insuring 100% trip-free performance under all conditions.

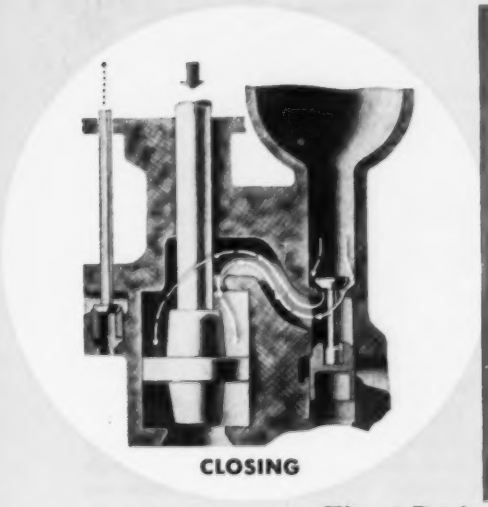
WHY HYDRAULICS ASSURE TOP PERFORMANCE

1. INELASTICITY OF HYDRAULIC FLUIDS PROVIDES INSTANT RESPONSE...the type OA operator, a closed hydraulic system, takes full advantage of this principle to provide immediate stopping or starting action. This permits rapid change in direction in breaker operation during a trip-free action.

2. HYDRAULIC COMPONENTS PERMIT PRECISE MOTION CONTROL...result in smooth performance. Hydraulic damping effect and dash pot action on both ends of the power piston stroke completely eliminate all overtravel. The ease with which opening and closing operations are effected marks a major design achievement.

3. HYDRAULIC FLUIDS ARE NON-CORROSIVE AND ANTI-SLUDGING...because of this, a long uninterrupted operating life without maintenance is assured. The closed hydraulic system prevents condensation, thus eliminating frequent servicing. As a result, complete safety and uniform operation is maintained...and maintenance minimized.

4. UNEQUALED TRIP-FREE ACTION UNDER ALL CONDITIONS...Hydraulic loading of trip latch permits trip-free performance throughout the entire closing operation and prevents latch chatter. Positive control between breaker and mechanism exists at all times.



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Report on DEMAND METERING:

Lincoln J2T Singlephase Thermal-Demand Watthour Meter.

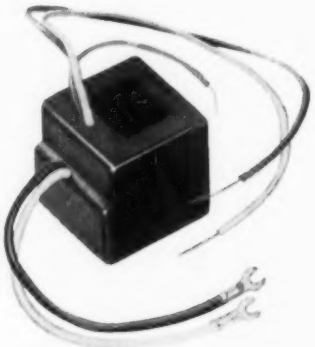
10 YEAR SERVICE RECORD PROVES 99.7% troublefree operation of LINCOLN THERMAL DEMAND METERS

A large southwestern utility operating over a wide territory, under adverse operating conditions, reports that only 0.3% of all Lincoln JT and J2T thermal-demand meters have given any kind of trouble over a ten year period of time.

This company has more than ten thousand of these Lincoln singlephase thermal-demand watthour meters now in service.

The J2T is ideally suited for application to singlephase residential and commercial loads. It is supplied with scale values of 12 KW, 24 KW, and 48 KW to take full advantage of the capacity of J2 Watthour Meters. It is also available with dual range scales for growing loads.

You, too, can cut demand measurement costs—eliminate maintenance troubles, by using Lincoln J2T Meters. If you would like to know more about the J2T, write us today.



Encapsulated coil assures maximum protection from lightning and high voltage surges.

The potential transformer coil of the demand element is encapsulated in a specially developed epoxy resin with extremely high dielectric strength. Thus, the insulation levels of the demand element and the watthour meter element in these combination meters are equally high.

SM57-1

SANGAMO ELECTRIC COMPANY

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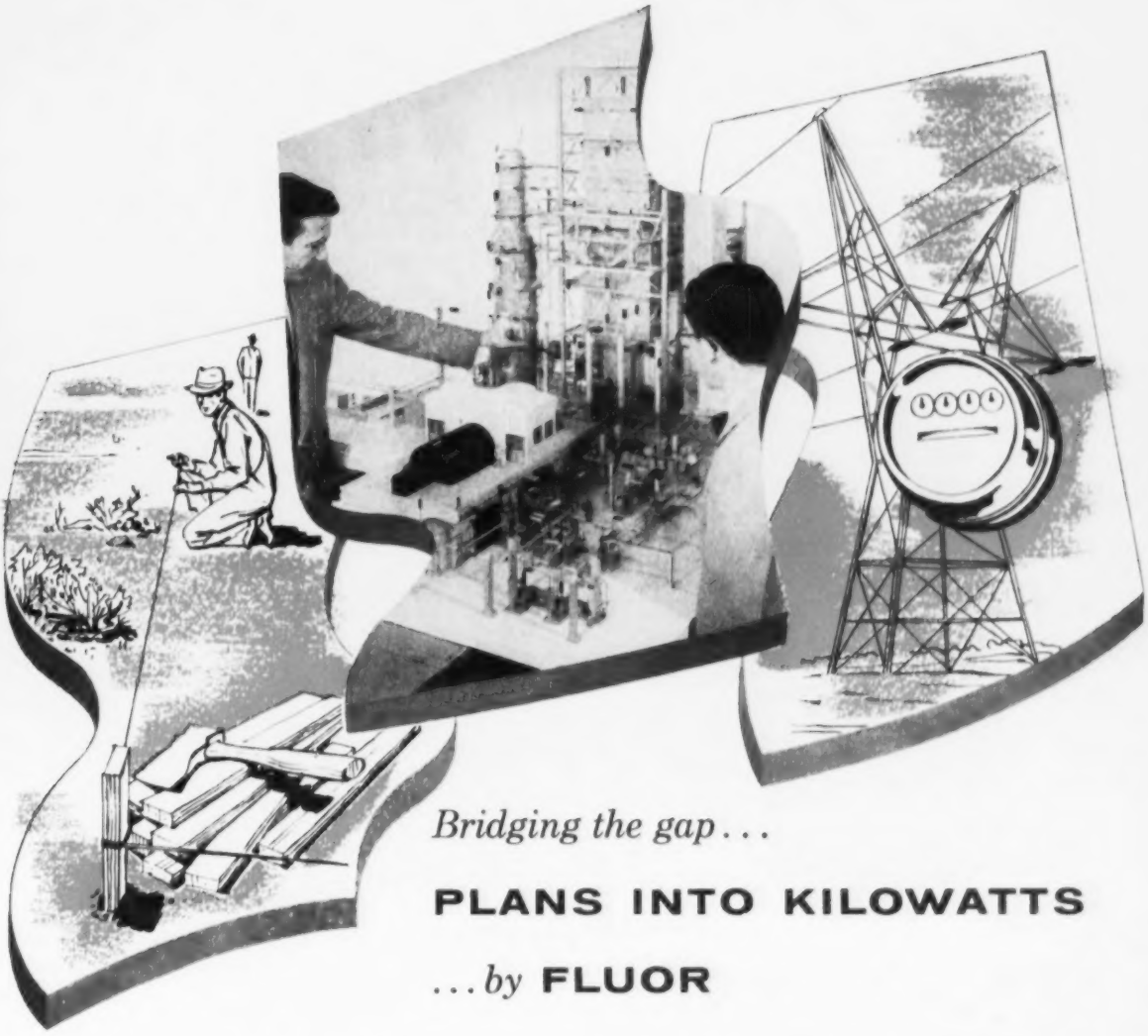

Bridging the gap . . .

PLANS INTO KILOWATTS

. . . by **FLUOR**

A study of America's growing economy shows why the electric power industry is building toward an estimated generating capacity of 2 billion kilowatts within the next 40 years.

For these new facilities, the power industry has found that it can look to the Power Engineering Department of The Fluor Corporation, Ltd. for plants characterized by early completion, construction within estimates and consistently high efficiencies. At Fluor, one of the best balanced, experienced engineering and construction staffs available in industry today stands ready to design and build plants of any kilowatt rating and any basic design: from conventional steam turbine to nuclear reactor. Modern methods . . . . symbolized by the detailed engineering model shown above (that of a steam-turbine unit) and the broad background of a permanent staff serving *many* industries . . . . combine to prove that in electric power, too, "you can be *sure* with Fluor."

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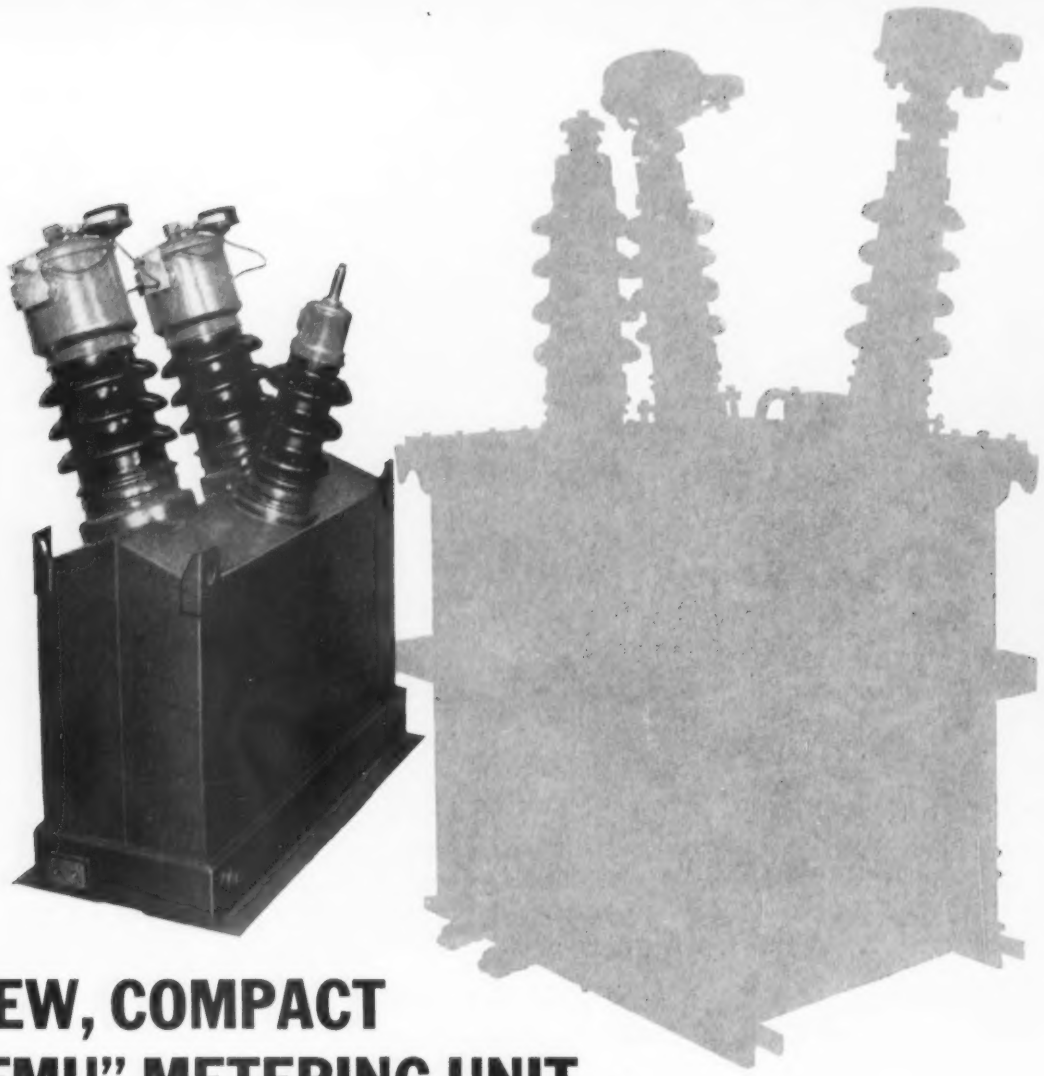

NEW, COMPACT "FMU" METERING UNIT...

up to 42% smaller, 62% lighter

The new line of all-weather outdoor metering units —Westinghouse Type "FMU"—with up to 35% less base area maintains the high accuracy and dependability of its predecessor, the Type "MP". Utilizing compact Form-Fit® design, the completely sealed "FMU" outfit reduces oil content—as much as 56%. Installation is simplified and speeded by weight reduction—up to 62% in the highest rating.

The new "FMU" metering unit, combining both current and potential transformers in one case, when compared with separate components, provides a smaller, neater package, with fewer connections and less installation time. Current ratios can be changed externally, by means of a series-parallel switch for each current element . . . an indicator, easily read from a distance, shows the type of connection.

Available for single- and three-phase service, with primary current ratings 10/20 through 400/800 amperes in 25-, 34.5-, 46- and 69-kv ratings.

For the complete story, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-70803

YOU CAN BE SURE...IF IT'S Westinghouse

3 Legs Make Twice the Derrick

With Holan's three-legged derrick, you are ready for any job at a moment's notice... butt-pulling... body-loading... extra-heavy lifts.

The integral third leg means crews won't have to sit idle while a separate third leg is being attached. And the integral third leg gives extra strength to provide a wider and safer working range.

This derrick was designed to do more than it has to. It lifts loads up to 12,000 pounds, poles 75 feet long . . . and has been load-tested at 22,000 pounds. For body loading, it hoists up to 5,000 pounds of equipment over the rear axle. Working range is 195° — the derrick head lowering to within five feet of the ground. Two levers at the rear of the truck body hydraulically control the derrick and live boom.

There's nothing else in the field like Holan's Series 3700 Live-boom Power Derrick.

Write for the Series 3700 catalog.

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Line construction bodies for light to heavy-duty. Crew compartments optional. Efficient tool compartments and drawers.

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Service bodies for chassis up to 1½ ton. Lengths, 72", 75", 84", 90" and 102".

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Light-duty power operated derricks for front or rear mounting. Operating range of 146°.

Ladders to 40' with all phases completely hydraulic. Pump actuated by P.T.O. or separate engine drive with electric starter.

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Hydraulic jacks, controlled from rear of truck. Rigid mounted or patented Holan self-stowing types.

Hydraulic towers with rotary, stationary, or transverse platforms. Exclusive box-girder telescoping mast.

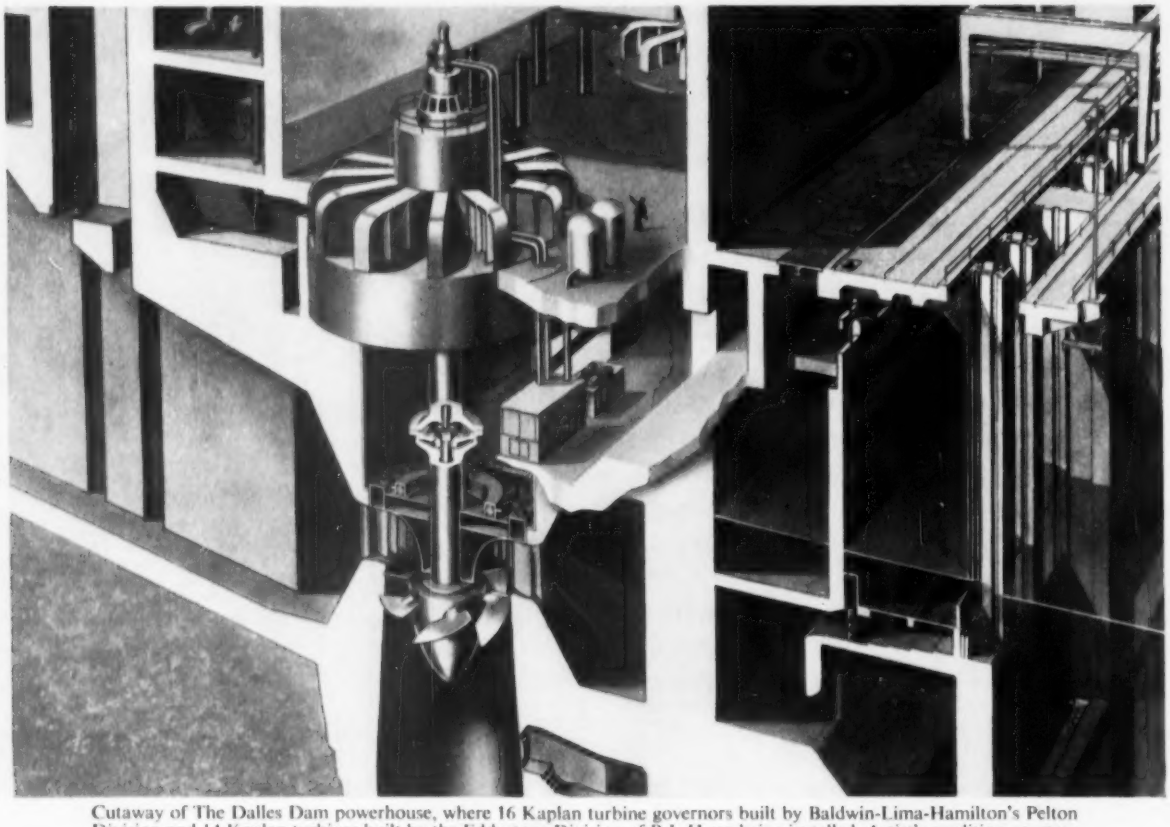
Pelton makes world's largest Kaplan turbine governors for The Dalles Dam

Of the 16 Kaplan turbine governors which Baldwin-Lima-Hamilton's Pelton Division is supplying for The Dalles Dam, located on the Columbia River, 14 are the largest ever built. Each has a wicketgate capacity of 950,000 ft.-lb. and a Kaplan blade capacity of 720,000 ft.-lb. In order to be absolutely certain that they will meet contract specifications in every respect, Pelton exhaustively tests these governors under simulated power plant conditions prior to installation.

In addition to governors, B-L-H is furnishing The Dalles Dam with 14 Kaplan type turbines, each rated to deliver 123,800 hp at 85.7 rpm under 81-ft. head. Station service units are also being produced for this project by B-L-H's Pelton Division. The Dalles Dam is thus a superb testimonial to Baldwin-Lima-Hamilton leadership in the design and manufacture of hydraulic turbines and related equipment.

For a copy of our newest illustrated bulletin, write B-L-H Corporation, Philadelphia 42, Pa., or Pelton Division (B-L-H), 2929 Nineteenth Street, San Francisco 10, Calif.

An inspection of one of the 16 Kaplan turbine governors for The Dalles Dam is made at B-L-H's Pelton Division.



Cutaway of The Dalles Dam powerhouse, where 16 Kaplan turbine governors built by Baldwin-Lima-Hamilton's Pelton Division and 14 Kaplan turbines built by the Eddystone Division of B-L-H are being installed. Artist's rendition courtesy of Portland District, Corps of Engineers, U.S. Army.

Pelton Division San Francisco, Calif.

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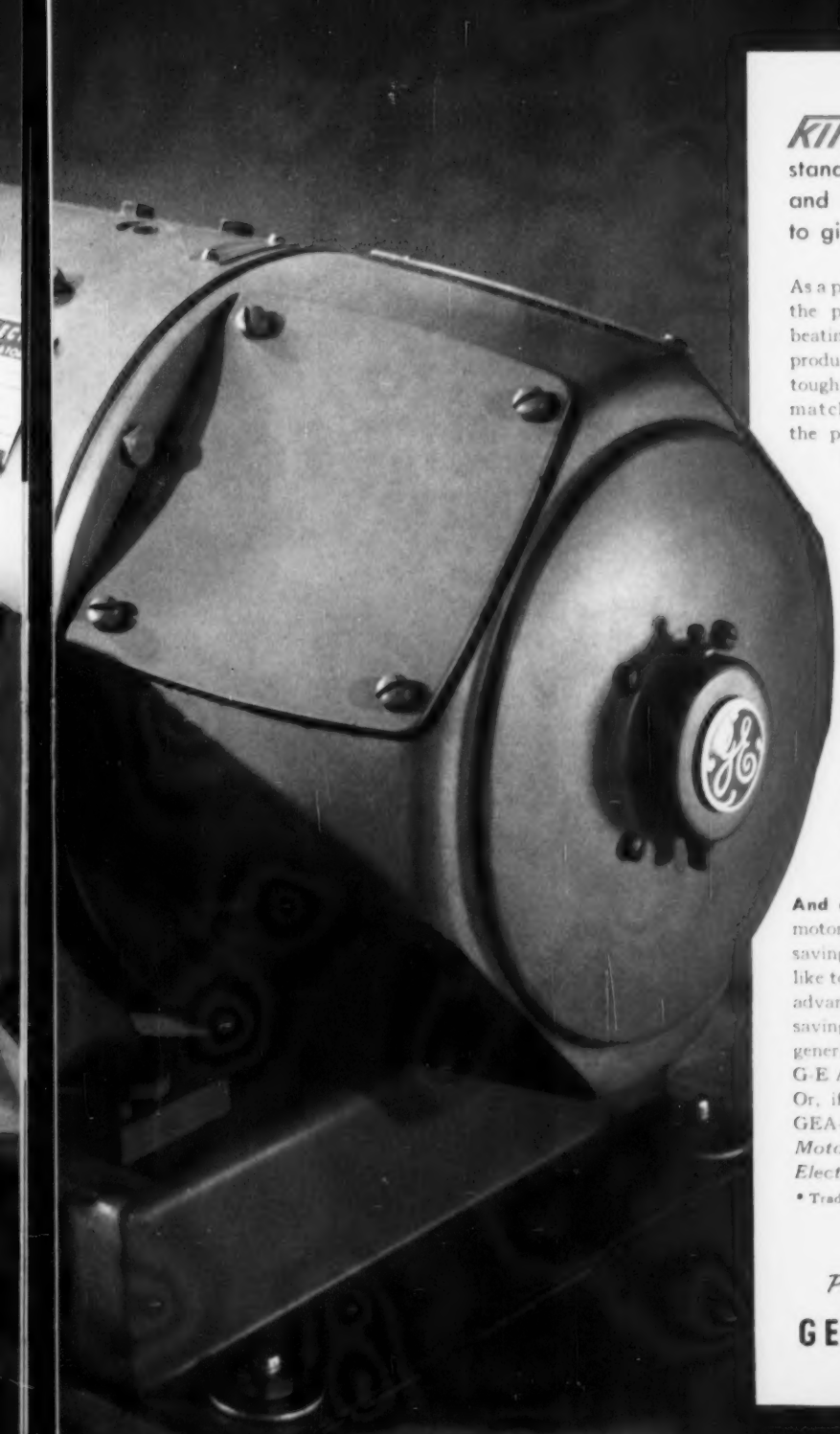

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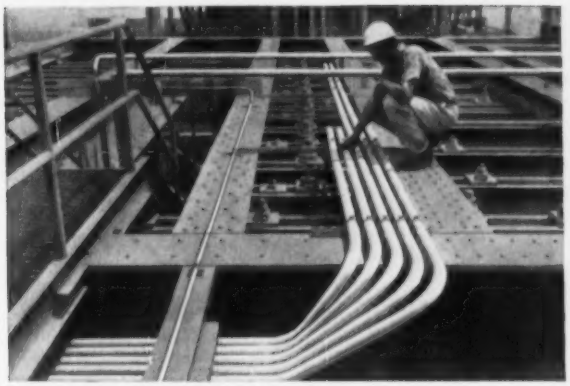
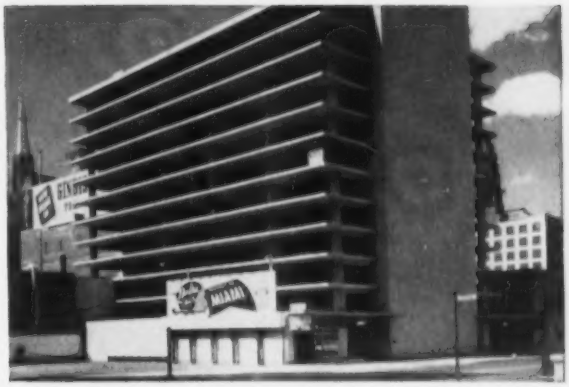


at Valley Steam Plant, Los Angeles Department of Water & Power . . .



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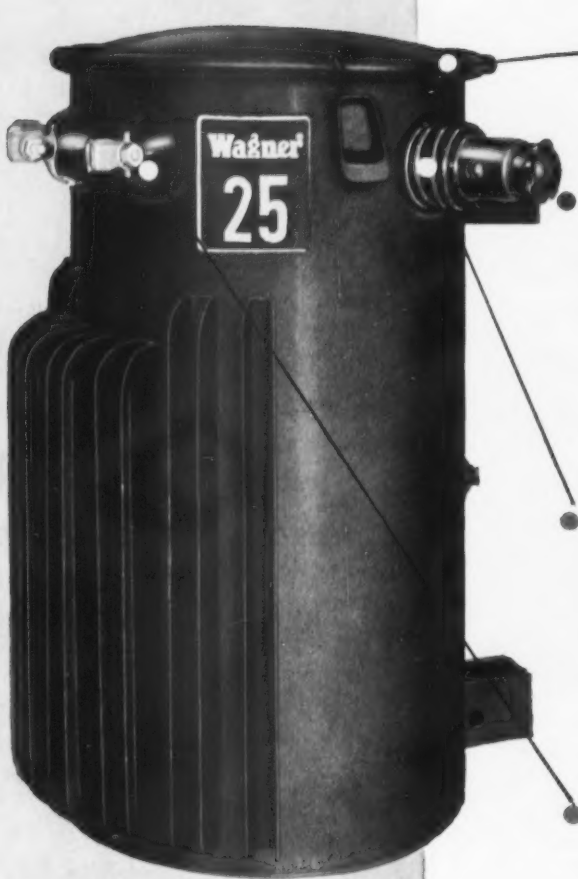

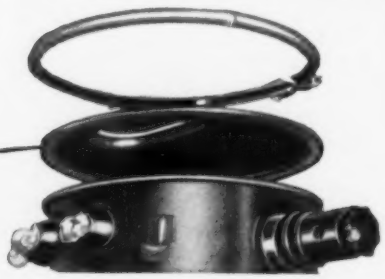

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Sealing gasket, held in place by retaining ring on cover, is uniformly compressed around entire circumference. Keeps transformer sealed air tight . . . no atmospheric moisture or dust particles can get inside. "Breathing" is completely prevented. Yet the cover may be easily removed by loosening a single bolt.

HIGH VOLTAGE SIDEWALL BUSHING
Permits the use of either copper or aluminum conductor. Insulating knob is designed for safer, faster, easier connections, without tools. Porcelain and terminal are locked in position.

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The bushing and terminal are key-locked to prevent turning when terminals are tightened. Eliminates loose terminal connections that could cause internal short circuits. Takes either copper or aluminum conductor.

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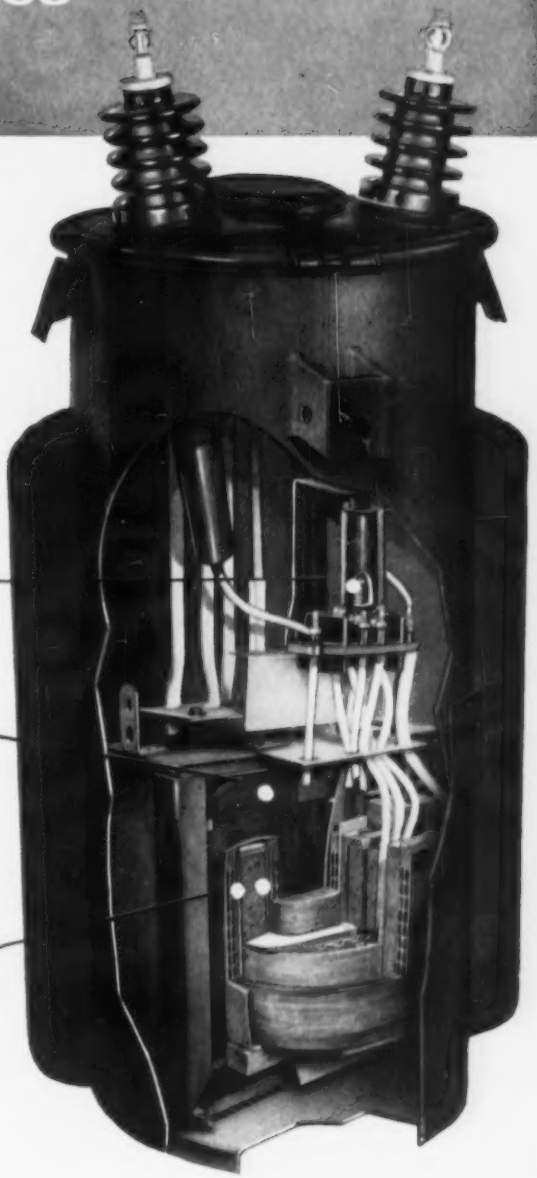
and electrical features

LONGER SERVICE LIFE!

Wagner Form W Distribution Transformers are exactly right for modern distribution systems. Their small size and light weight make them easy to handle—to store—to mount on poles.

Form W Transformers come in a complete range of single-phase ratings, 500 kva and smaller, 69 KV and below. All Form W Transformers, in ratings 3 through 167 kva, 15 KV and below, are designed for pole mounting.

You can choose either conventional or protected type Form W Transformers for your distribution lines with full confidence that they will pay dividends in longer service life.



ROTARY TAP CHANGER

Positive action . . . pre-loaded spring maintains constant pressure between the moving contact and the tap studs.

FORM W CONSTRUCTION

CORES are of cold rolled oriented grain transformer steel, cut into two turn sections, which are assembled through and around the coils.

COILS are wound of pure copper wire or strip, with high dielectric insulating material between layers in the high and low voltage windings. Insulation has crimped edges to hold windings accurately in place to permanently maintain electrical clearances.

BONDED INSULATION

An improved thermo-setting material for layer, channel and barrier insulation is bonded to the coil conductors to give the coils great mechanical and electrical strength.

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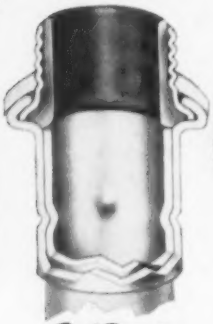
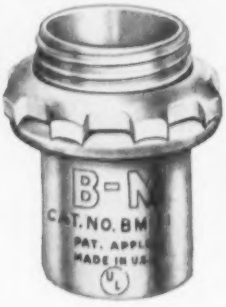
the original concrete-tight **INDENTER FITTINGS** *for E.M.T.*

Red Throat
Insulated Connector



Red Throat
Cross section



"BM" #100
Cutter for ½, ¾ and 1" E.M.T.

"BM" #1000
Holder for ½, ¾ and 1" E.M.T.

"BM" #600
Changeable Jaw Indenter

THE NEW BM607 INDENTER FOR ½" FITTINGS

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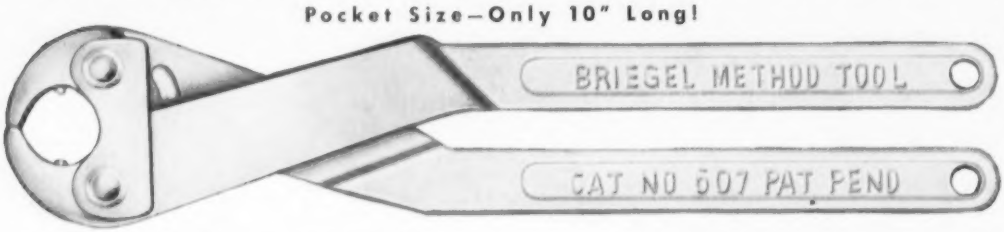

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All B-M Indenter Fittings are U.L. Approved as concrete-tight and all Compression Fittings as rain-tight as well as for general use (File Card E10863). Also comply With Federal Specifications W-F-406.

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SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

smart modern appearance

helps make CHROMALOX Electric Baseboards the Quality Line

Homeowners are quick to appreciate the clean, streamlined styling of Chromalox Electric Baseboard Heaters . . . and their smooth, uncluttered flow from wall-to-wall and around corners.

With factory-primed surface, they're ready to paint in any color desired. No need to convince Mrs. Homemaker that one of 27 shades of white or other factory colors "will look just fine."

The *top-front* warm air discharge —another Chromalox quality design feature—avoids messy wall streaking . . . makes the world's cleanest heat just that.

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And the silent, finless Chromalox strip element cannot catch or char dust, dirt and lint, will never sag.

Available in four practical lengths. Two adjacent connections wire-up 16 feet of heat. Simply attached and connected. Wiring from bottom, back or either side. Built-in thermostat and convenience outlet sections also available.

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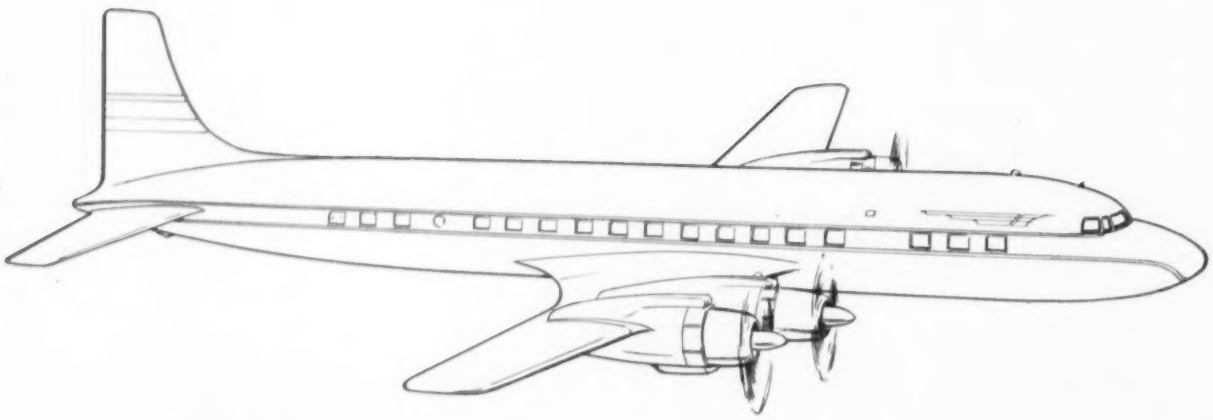


FORGED PROPELLERS *keep airplanes in the air . . .*

FORGED SUSPENSION CLAMPS *keep transmission lines up there too!*

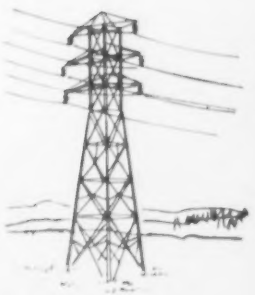
ALL COMMERCIAL AIRCRAFT . . .

now in service have forged aluminum propellers. Because they are drop forged, the blades have maximum strength with minimum sectional thickness and weights. Forged propellers with their superior physical properties withstand the centrifugal forces, fatigue strains and impact shocks imposed by present day aircraft.

DROP FORGING makes the difference in airplane propellers and Suspension Clamps. BTC Drop Forged Suspension Clamps, for example, develop uniformly high strength—more than adequate for field service. Heavy sections or reinforcing ribs are not needed for strength or to prevent collapse or breakage under U-Bolt Clamping pressure. Thus, undesirable weight is eliminated without sacrificing strength.

The BTC Clamp's superior strength guards against failure under severe loading, while its greater hardness prevents excessive wear on connecting surfaces. No bore size allowance for manufacturing variations is necessary due to the close dimensional fidelity of the die-forged parts.

BTC Suspension Clamps are recommended for application on all transmission line conductors in general use. Choose the right Clamp for your conductor from BTC's complete line of Drop-Forged Steel or Aluminum Suspension Clamps.



6200A SERIES

Steel Suspension Clamps. Drop-forged steel, hot-dip galvanized, suitable for all conductors. All clamps may be supplied with Aluminum or Copper Liners as required.

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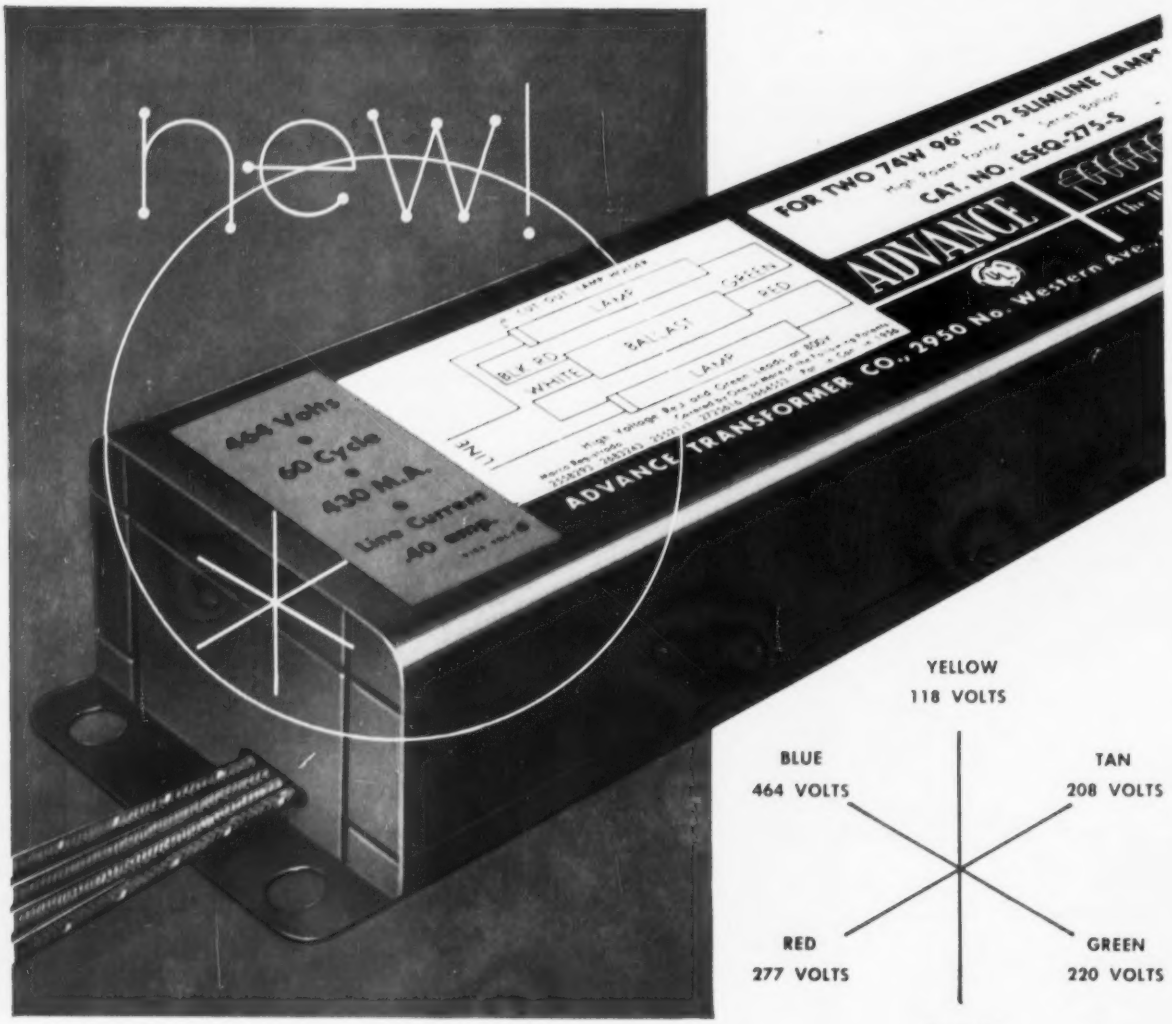
M.P.L. (Minimum Power Loss) Aluminum Suspension Clamps. Drop-forged, heat-treated Aluminum Alloy Clamps for A.C.S.R. and All-Aluminum Conductors.

Specify BTC **DROP-FORGED Hi-Line Hardware**

. . . from your Insulator Manufacturer

The BREWER-TITCHENER CORPORATION, Cortland, N. Y.



ADVANCE *VISA-VOLT*®

Now, Advance Transformer Company brings you VISA-VOLT® . . . color coded fluorescent lamp ballasts for instant, positive voltage identification. VISA-VOLT®, another first for the world's largest exclusive manufacturer of fluorescent lamp ballasts, does away with uncertainties by clearly defining circuit voltage, line current, lamp current and other pertinent electrical data. VISA-VOLT® is your assurance that the correct ballast is being utilized in a specific lighting installation.

These Colors Instantly Identify Your Advance Ballast Voltage

Insist on VISA-VOLT® color coding and eliminate costly guess work in your next fluorescent lighting installation.

Start today to enjoy the many advantages of Advance quality fluorescent lamp ballasts . . . ballasts which provide longer life, quieter operation, higher light output, trouble free operation, CBM certification . . . fluorescent lamp ballasts which are guaranteed and continue to serve as "The Heart of the Lighting Industry".

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University of Michigan's Switching Station

Uses Youngstown "Buckeye" Conduit

to Protect Electrical Wiring Systems . . Permanently

University of Michigan's new, up-to-the-minute, West Hospital Switching Station has positive, permanent electrical system protection—thanks to Youngstown's Full Weight Rigid Steel "Buckeye" Conduit. Damaging elements such as water, moisture, vapor, dust and dirt will never cause electrical faliure—because "Buckeye" will be on the job around-the-clock for the life of the building.

Electrical systems that fail to function properly are definitely a bad investment—from any standpoint. So to make sure your installations are safe and efficient, always specify Youngstown "Buckeye" Conduit—as so many of our leading owners, architects and contractors have done for years.

Satisfied "Buckeye" users across-the-country report to us, "It's easier to thread and bend—easier to fish wires through—and best of all, we get longer service life because it's so thoroughly corrosion-resistant."

Leading distributors in all industrial and electrical markets are ready to serve you quickly and efficiently from their ample stocks. They're as near as your phone—why not call today?

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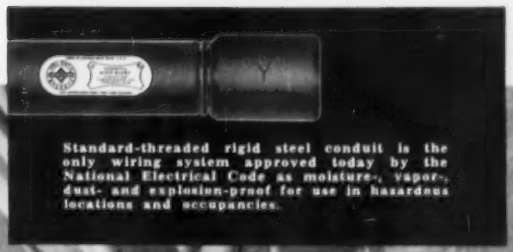


Standard-threaded rigid steel conduit is the only wiring system approved today by the National Electrical Code as moisture-, vapor-, dust- and explosion-proof for use in hazardous locations and occupancies.

NEWEST REASON WHY ALL TRANSFORMERS ARE NOT ALIKE

Transformer goes 1,000 mph

In just one hour, packaging test for General Electric distribution transformers gives as much punishment as 1,000 miles of travel over roughest roads. Result: You get G-E transformers in tip-top shape.

General Electric distribution transformers arrive at your door in crates designed to help cut your transformer handling costs . . . thanks to an eight-year package-development program and use of new testing equipment.

You can practically forget damage claims with all their red tape because damage in shipment is almost nil. You also avoid the expense and nuisance of recrating and reshipping for repairs.

New test equipment proves crate toughness

At our Package Development Laboratory, Schenectady, N. Y., we thoroughly test wood, wire, and crated transformers with the most modern test equipment available today. In test at left, for example, a vibrator gives in one hour as much punishment to a crated transformer as it would receive in 1,000 miles of travel over the roughest roads. In another test a different machine gives the crated transformer an impact equivalent to freight-car "humping" at eleven miles per hour.

Crate design conserves floor space, simplifies stacking

Warehouse men can conserve floor space because G-E crates permit stacking of transformers up to four high . . . can simplify handling because one lift truck can move as many as four transformers at a time.

Linemen save time because the transformers are easy to remove from the crates. A pair of snips quickly cuts the wire bonds.

Wreck proves crates protect transformers

G-E distribution-transformer crates probably got their toughest test in shipment—quite unintentionally. A freight car loaded with transformers derailed and overturned enroute to the G-E warehouse at Charlotte, N. C. Expecting transformer mayhem, General Electric and railroad officials rushed to the spot. But not one transformer was even scratched!

All Transformers Are Not Alike

Engineered packaging is only one advantage of General Electric distribution transformers. Others include *Formex* wire* for reduction in tank size, *new and improved circuit breakers* for self-protected transformers, *complete warehouse stocks* to save utility inventories—evidence that all transformers are *not* alike.

For complete information contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to General Electric Company, Schenectady 5, New York. 431-51

LIVE BETTER ELECTRICALLY

**Reg. Trademark of General Electric Co.*

STACKED TWO HIGH on finger-lift truck, four crated transformers can be easily moved, loaded, and unloaded in minimum time.

IMPACT TEST, the equivalent to a freight-car "humping" at eleven miles per hour is given to crated transformer—without damage.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NUCLEAR NEWS FROM ATOMICS INTERNATIONAL

OMR a promising approach to meet world's need for small to large power plants

An important goal of the Atomic Energy Commission's program to develop electric power from the atom is a low-cost reactor for plants with gross outputs of 10 megawatts or more. Such plants are particularly suited to areas that need relatively small increments of additional power, and to those parts of the world where coal, oil, and water-power are scarce or costly.

The OMRE (Organic Moderated Reactor Experiment), which ATOMICS INTERNATIONAL is now building at the National Reactor Testing Station in Idaho, is one of the more promising types for this purpose. The new experimental reactor was pioneered by ATOMICS INTERNATIONAL — from preliminary design to prototype.

It will be used to investigate the rate of degradation of organic fluids, the properties and compositions of the equilibrium mixture in the reactor, and the effect of organic fluids on heat-transfer surfaces. Results of these experiments will be incorporated into the nuclear power plants ATOMICS INTERNATIONAL is planning for Piqua, Ohio and a Latin American country.

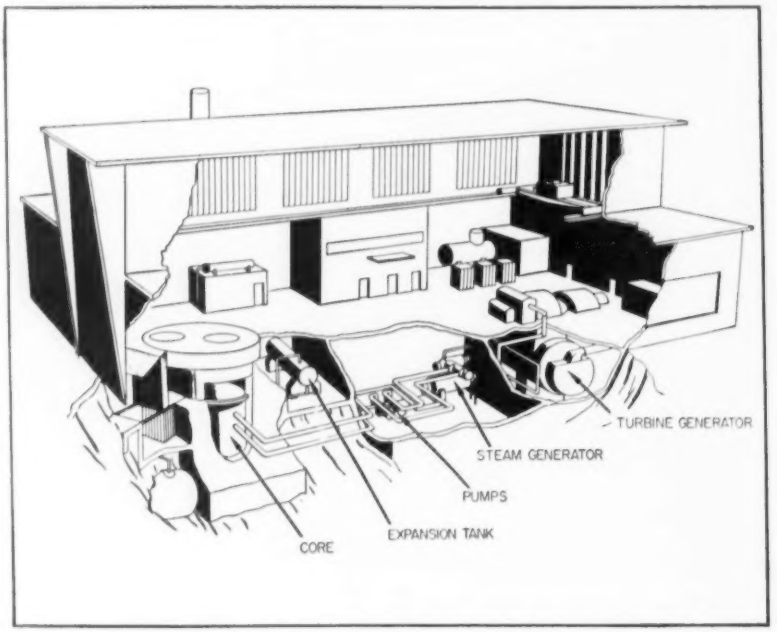
Basic advantages of the OMR are small size, compact core with good neutron economy, and elimination of problems with high-pressure primary coolant circuits and uranium-coolant reaction hazards. Its safety features are outstanding. The high boiling point of the organic moderator-coolant fluid permits a low-pressure system. There are no chemical incompatibilities between coolant and uranium or coolant and water, and no unusual corrosion problems. Because of its fluid moderator—an isomeric terphenyl—the OMR has a negative temperature coefficient of reactivity, which acts as a governor in case of power surges or excess power levels. The organic fluid becomes only slightly radioactive, which makes the entire heat-transfer system relatively accessible.

A typical power plant, such as the one proposed for Piqua, Ohio, has a gross electric output of 12,500 kilowatts and a heat output of 45,500 thermal kilowatts. It produces steam at a pressure of 415 psig (29 kg/cm²) and a temperature of 550°F (288°C).

The reactor core is heterogeneous, with fuel elements and control rods immersed in the moderator-coolant fluid and contained in a thin-walled core tank. The fuel is uranium slightly enriched in U^{235}.

Power costs for this reactor, including both capital and operating charges, are estimated at 18 mills per kilowatt-hour. Power costs will be significantly lower in larger OMR plants. Lower power costs are also expected to result from advances in OMR technology.

Atomic power for supertankers. The AEC has assigned ATOMICS INTERNATIONAL the challenging design study to adapt the OMR for maritime use. The OMR, considered a promising possibility for ship propulsion, is expected to be particularly suitable for supertankers. The OMR offers the safety of a low-pressure system, low construction costs (because it can be built of aluminum and mild steel instead of more expensive zirconium and stainless steel), and low maintenance costs.



Typical OMR Central Station Nuclear Power Plant

ATOMICS INTERNATIONAL is staffed and equipped to help you with any phase of reactor development. Please write: Director of Technical Sales, Dept. ET-72, ATOMICS INTERNATIONAL, P. O. Box 309, Canoga Park, California. Cable address: ATOMICS.

ATOMICS INTERNATIONAL
A DIVISION OF NORTH AMERICAN AVIATION, INC.
PIONEERS IN THE CREATIVE USE OF THE ATOM

GEDNEY'S RIGHT THERE IN YOUR CORNER

helping save time . . . hold down costs

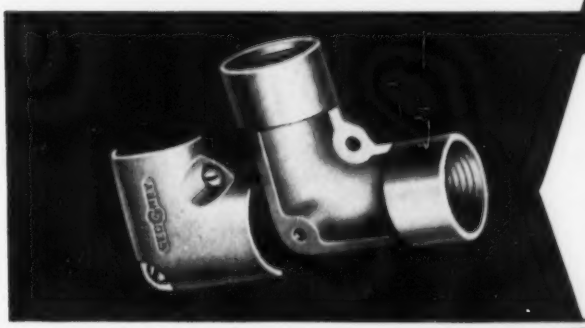
CORNER FITTINGS? Well, here are three that have proved immensely popular for the simple reason they're easiest to install—save time and labor that really counts up. Like the rest of the full Gedney line they're made of unbreakable malleable iron...accurately machined and threaded . . . individually inspected. Order Gedney—always—for lowest installed costs!

90° CORNER ELLS

Fitted with gasketed cover. Both ends female. Made of malleable iron, cadmium plated. Available in a full range of sizes from ½" to 2".

90° CORNER ADAPTERS

Fitted with gasketed cover. One end male, one end female. Made of malleable iron, cadmium plated. Your choice of sizes from ½" to 2".



CORNER PULL-IN CONDUIT ELLS

Today's top specification for space-saving, machine wiring, easy wire pulling. Malleable iron, cadmium plated. Sizes run from ½" to 2".

GEDNEY FITTINGS FIT

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Foundry, Factory and Shipping Point: Terryville, Conn.

take a long look at...

meter economics

You can effect prompt and progressive savings by standardizing now on the *meter of the future* — the Westinghouse Lifetime 30-ampere, single-phase meter. With full 200-ampere extended range, it will measure all present and future single-phase residential loads that can be provided on single-phase service, and *it is guaranteed for 30 years.*

This year, 57% of the single-phase watthour meters purchased and installed by the Electric Utility Industry represented change-outs due to obsolescence in the face of growing load. The other 43% went on new homes with high initial loads and rapid growth potential.

This new 30-ampere Westinghouse meter certainly is the meter for this year — and '66 — and '76 — and even '86. First, consider the value of simplified inventory — if you standardized! Then take notice that there is *not one cent more investment,* initially, *than for modern 15-ampere ratings.* There's no mathematical trick. Call your Westinghouse sales office, or your Westinghouse meter specialist . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-40493

YOU CAN BE SURE...IF IT'S

Westinghouse

ELECTRA'S HUSBAND

A GOOD rain storm; popcorn doused with butter and a glass of sherry always had a quieting effect on Electra. Suffering from comfort with these luxuries, I had kindled a fire and had planned to broach the subject of a vacation trip to Mexico with her majesty. The timing seemed to be right.

Electra glanced up from the paper and inquired, "What is all this to do about atomic power plants? Are we really falling behind in the production of electricity from atomic power?"

"Yes, we have apparently fallen behind Britain—much in the same manner that we are behind China in the production of rickshaws."

"Sour grapes," she chided.

"No, the analogy is fairly good, the U. S. doesn't need atomic kilowatts any more than we need rickshaws. The ironical thing is that Great Britain has to resort to a crash program of atomic development, using almost a primitive type of reactor because under the country's socialized mining setup, the mines don't mine coal fast enough to meet power demands. Over here we can still supply all the kwh needed in cheaper ways."

Electra stiffened. "It's all well and good to talk about cheaper ways, but isn't our national defense at stake?"

"Probably not. It's pretty well agreed that the development of atomic weapons should be directed and carried out by government agencies or contracts. In addition, any applicable know-how that comes from private research should be integrated into the defense effort. Private contributions are probably *greater* because we are not in a kilowatts race but in a know-how search."

"Double talk," jibed Electra.

"Sounds that way, doesn't it? It's not double talk, but a multiplicity of related topics. Perhaps this thought will make the relationship clear. Economically the nation's utilities have a much greater limitation on their ability to spend for nuclear research than does the government—moreover, their business is power, not defense. So to best serve their stockholders, customers and the nation we have seen many nuclear installations, small from the point of view of kilowatts, but extremely important technologically. In short, while it is cheaper for us to make kilowatts with conventional fuels, our basis for competition should be for technical superiority — that is, quality, not quantity. When the problems are solved that are keeping nuclear energy from being cheaper

"It's Papa Who Pays"

than fossil fuels, then you will see the utilities go all out for nuclear power."

Electra softened. "Sounds pretty good, I guess, but how are you doing in the quality department?"

"No one really knows, but the indications are that our first large-scale nuclear plant will produce power more cheaply than the British Calder Hall units. It would be unfair to compare other plants like Santa Susanna or Vallecitos, since they are so much smaller. But each of these pilot models uses a different principle and different techniques so that the larger units that will probably be coming along will be drawing on the best of a rather broad sample. It would be reasonable to expect the plants of the next few years to grow in size, but to be still smaller than the largest coal or oil plant until the economics shift in favor of the nuclear fuels."

Electra queried, "Is this like not mass producing a car model until the final design is approved?"

"Exactly! Big projects that would take longer to build and more money would actually slow down the effort. This being a young industry it needs *know-how* rather than size. But here is the problem. Many people's approach is too Texan. We want to stagger 'em with numbers. This is the reason that politicos who honestly don't understand the picture are booming for more government in the atomic power business."

Electra could see my dander start rising so she baited me a little. "What's so bad about a few government atomic stations?" she asked.

"What's so bad," I barked, almost choking on a popcorn kernel. "Why once the public power zealots ever got approval to spend taxpayers' money for atomic stations, they would push subsidized federal power into every section of the country. It's tough enough now on the free enterprise companies who are in the middle or on the fringe of the big river valleys. What would it be like if a power source built on phony accounting, with low-cost federal money and peddling its output under the preference clause, could be plunked down anywhere in the country subject to the whims of pork-barrel politics, political log-rolling and the public power bloc's empire building?"

"You don't make it sound very attractive," mused Electra.

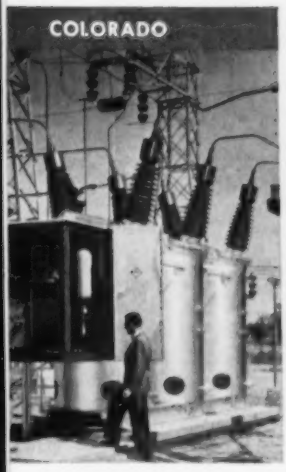
"It isn't a very attractive prospect for the people, either as taxpayers or as free citizens. The crux of the matter is the same as with any government-in-business situation. Therefore, whether the development is done by private industry or by the government, papa pays. The fact is that the present booming is for big plants in a kilowatt-race type of operation, and would indicate that the government would spend considerable more money than the present private groups are spending. Development of an idea into high production is the one virtue that both parties laud in American industry. Why not let 'em alone?"

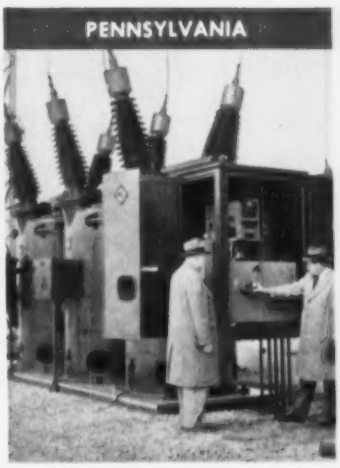
"How about partnership in the atomic program?"

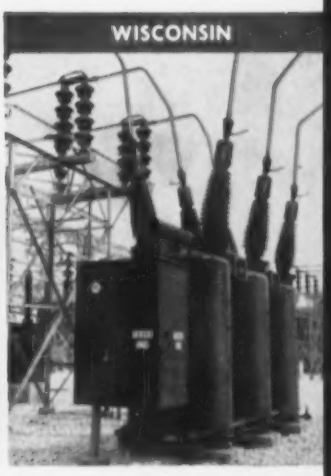
"Teamwork always makes sense. If the government wants to underwrite that part of a nuclear program that will be applicable to defense, then it makes sense. The teamwork approach probably has the greatest appeal to the thinking nonpartisan—and that's where I'm putting my money."

Electra giggled. "As you say, it's papa who pays, and you better get at your income tax or our slim bank balance won't stand the April 15 gaff. Then if there is anything left over I think I would like to go to Mexico this year." Electra paused, "But there never is. After paying Uncle, about all we'll be able to afford is another bottle of sherry and reserved seats on our patio."

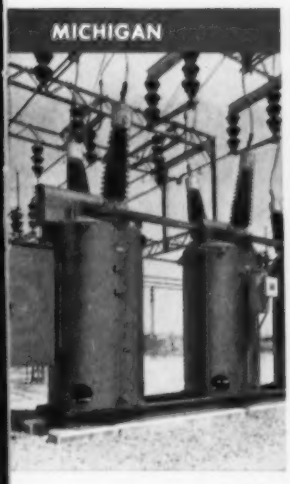
Utilities everywhere like Pneu-Draulic operators

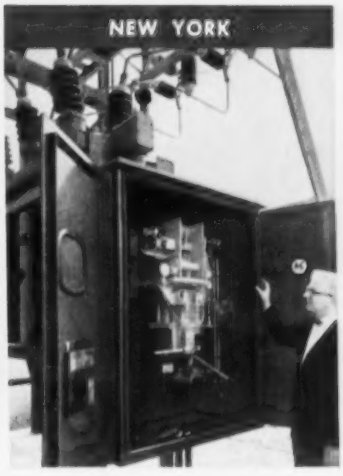


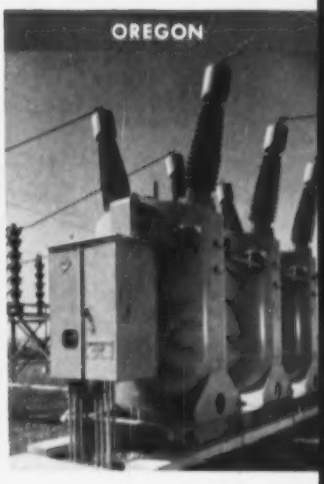




for their simplicity, reliability







Pneu-Draulic **operators offer Utilities many advantages:**

- Simplicity — Compact design with few moving parts.
- Eliminates moisture, and corrosion problems — Entire system filled with oil containing inhibitor which eliminates rust, freezing and corrosion.
- Safe emergency closing — Breaker can be closed *safely* at full rated speed onto energized line even when no control power is available.
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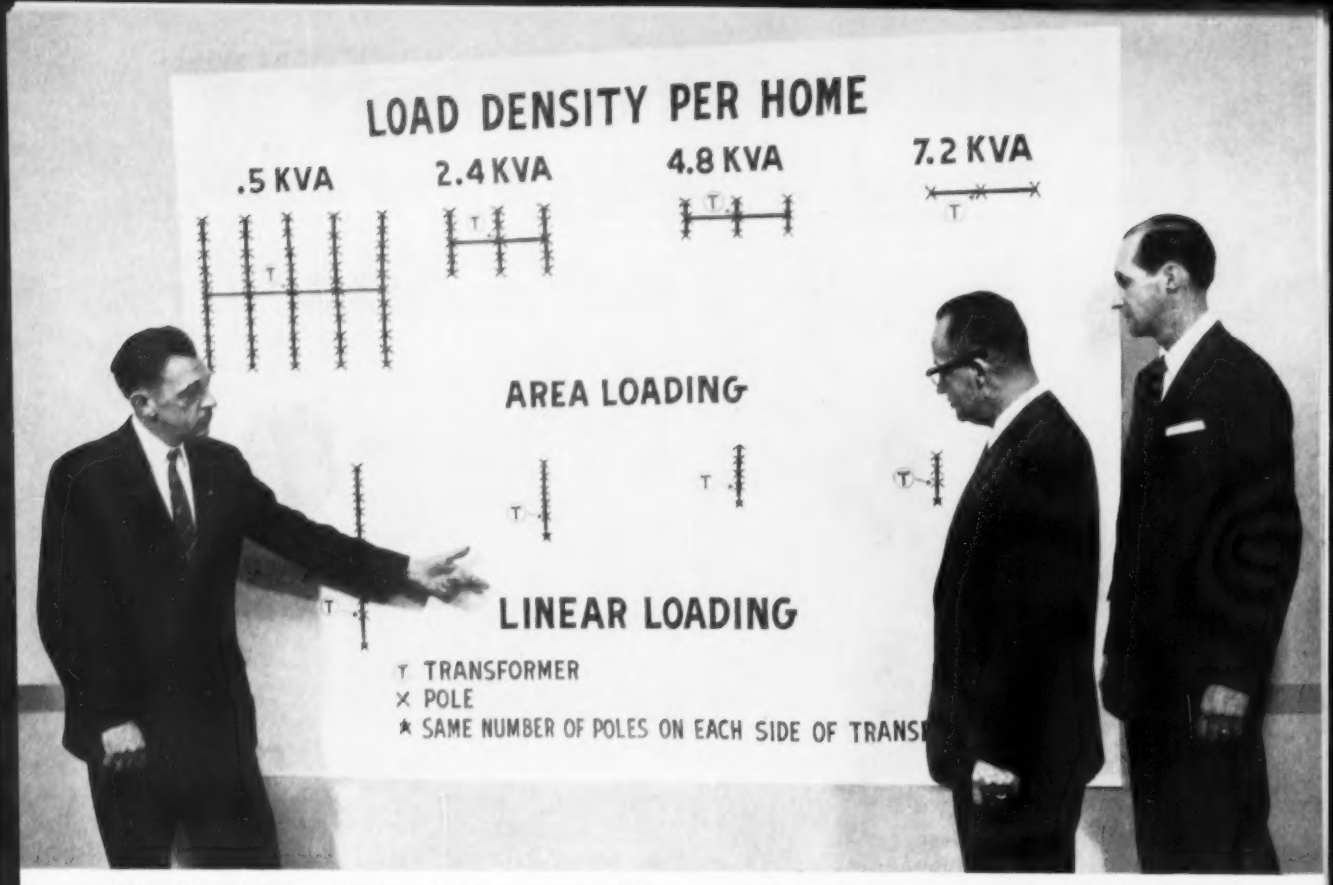
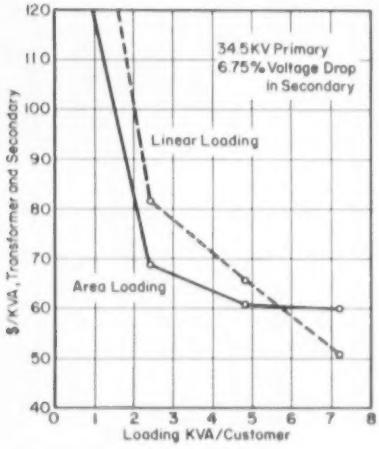


LOAD AREA GEOMETRY shows linear loading more economical for future residential secondary systems. F. C. Van Wormer, G-E Engr. who developed the theory, discusses it with New York State Electric & Gas Supervising Distribution Engr. H. L. Livingood and G.E.'s P. Kartluke.

On tomorrow's secondary distribution systems . . .

Which will be most economical, linear or area loading?



LOWER COSTS for linear loading beyond density of about 5.75 kva per customer are evidenced by this graph. Savings could be achieved at a lower density on a 12 kv primary system.

As residential load densities increase, more and more complex engineering calculations are required in determining how to supply higher loads on residential secondary distribution systems. These calculations may be greatly simplified by applying a General Electric load area geometry theory. This theory provides a quick, accurate engineering tool for use in studying any utility's residential secondary system.

Load area geometry predicts (see chart above) as residential load density increases, the length of laterals in the area system decreases much more rapidly than the length of mains. Thus, area loading reverts to an impractical type of linear loading.

A recent economic analysis of residential secondary distribution systems confirmed the predictions of load area geometry. It showed (see chart left) although area loading is economical for light load densities, only linear loading offers economic superiority for the heavier loads forecast for tomorrow.

New York State Electric & Gas power distribution system planners have found load area geometry theory valuable in analyzing circuit arrangements. In applying this theory to their system they have saved considerable engineering time and have developed more flexible and practical distribution systems capable of expanding with rising load density.

For more information on load area geometry, write General Electric Co., Section 301-349, Schenectady 5, New York.

LIVE BETTER ELECTRICALLY

MORE POWER TO AMERICA

GENERAL ELECTRIC

ELECTRICAL WEST

VOL. 118, NO. 4
APRIL 1957

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

California's Trinity project spotlights the economic facts of partnership benefits. For the first time the federal power advocates are confronted with clear-cut dollar figures in the case of . . .

The People Vs "Preference"

The Trinity project is more than just a unit in the California Water Plan. It is an issue with national significance because partnership benefits for all can be compared with power "preference" treatment for a few without the controversial accounting procedures of navigation, flood control and irrigation incident to most federal projects.

Partnership developments, as proposed by the Pacific Gas and Electric Co. and recommended to Congress by the U. S. Department of the Interior, would save the people of the United States $56,000,000 in first costs, yield $248,000,000 in revenues and taxes to the federal government and $62,600,000 in state and local taxes over a 50-year period.

In contrast to this, full federal development with the power marketed through the Central Valley project would tap the U. S. treasury for an additional $56,000,000 in first costs (plus annual interest and depreciation charges). It would provide power savings to local preference customers (estimated to be less than 7% of the population of the area) of $47,000,000 over that same 50-year period and would produce a surplus of only $113,858,000 without any tax yield whatsoever.

The accompanying table containing figures taken from the report of the Secretary of the Interior to Congress shows that the partnership development of the Trinity project would result in a net gain to all the people of the country of at least $224,000,000 over the next 50 years.

The latter figure represents the difference between the gross payments to be made by PG and E to federal, state and local governments ($310,000,000) and the estimated* additional cost of future power consumed by federal agencies and "preference" customers. To date there has been no better factual evidence to support the general philosophy of President Eisenhower's partnership policy of the country's resource development.

The Trinity River Project

The Trinity River in the extreme northwestern area of California drains the heavy rainfall of that region into the Pacific. The Trinity project is basically a water conservation scheme which would store 2,500,000 acre-ft of surplus runoff for diversion through a system of dams and tunnels into the Sacramento River above Keswick Dam (see map). Annual average diversion into the Sacramento for downstream irrigation in the Sacramento and San Joaquin Valleys would be about 865,000 acre-ft. The total static head between maximum elevations of the Trinity and Keswick reservoirs is 1,783 ft. From the standpoint of the U. S. Bureau of Reclamation, the power phase of the project is strictly a by-product that would help defray the cost of the water thus conserved for irrigation use farther south in California. It is estimated that the annual production from the project would be 1.15 billion kwh.

Congress authorized the Trinity project for construction, operation and maintenance by the Secretary of the Interior in August of 1955. The act contained a provision which directed the secretary to negotiate for the purchase of falling water by any nonfederal agency that appeared economically feasible.

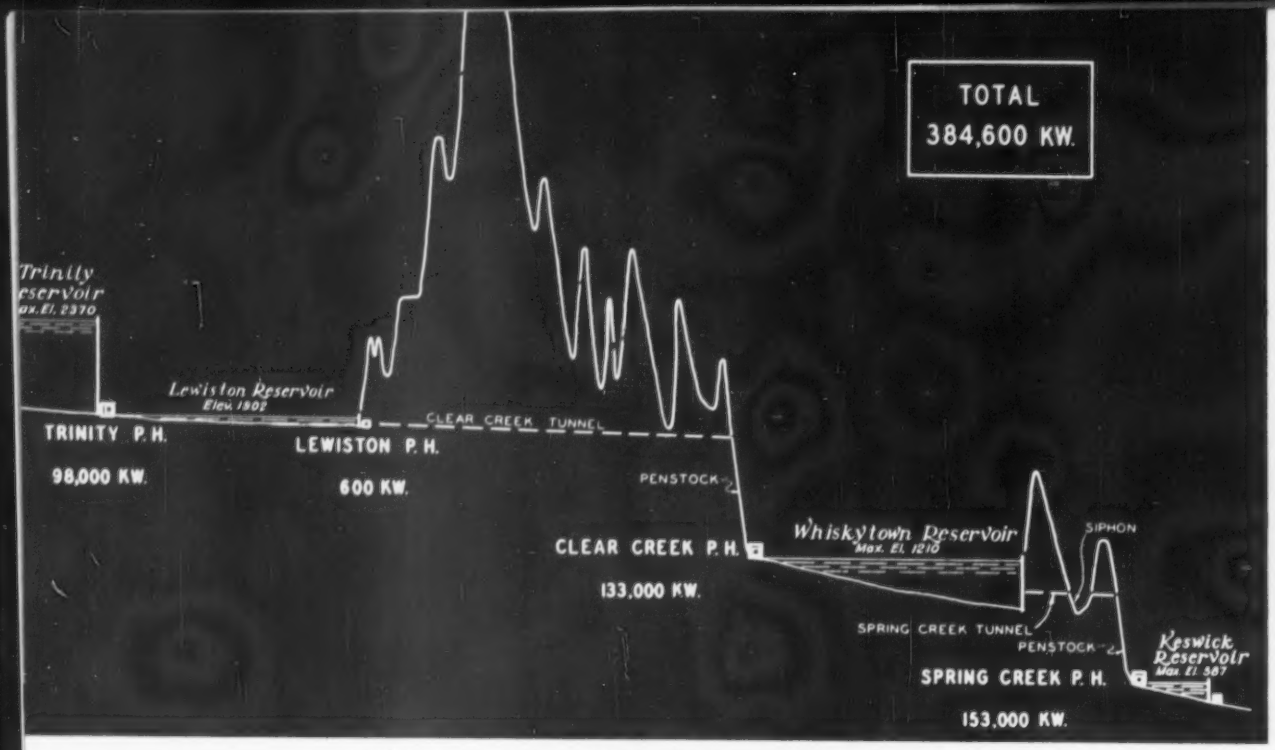
Of the many prospective preference and nonpreference purchasers

* By the USBR prior to construction of the San Luis unit of CVP in report to the Secretary of Interior, Feb. 11, 1957.

Economic Facts of Partnership Trinity Project

Item	All-Federal Development	PG and E Partnership Development
Gross revenue (based on present rates)	$973,912,000	$929,495,000
Deductions (expenses)	333,611,000	250,216,000
Net revenue	640,301,000	679,279,000
Disposition of net revenue:		
Interest paid into U.S. treasury	128,878,000	57,906,000
Power investment amortization	292,037,000	228,363,000
Irrigation assistance	105,528,000	113,550,000
Surplus	113,858,000	279,260,000
Partnership net gain to U.S. for falling water		165,402,000
Plus taxes paid U.S. government	none	83,000,000
Plus taxes paid state and local governments	none	62,000,000
Gross public benefits from partnership		310,000,000
Less additional extra cost* of future power to federal agencies and "preference" customers (less than 5% of population of California)		86,000,000
Minimum net partnership savings to people of U.S. and California		224,000,000

*Future power requirements to these agencies would be marketed by PG and E under nondiscriminatory rate structures approved by the California Public Utilities Commission.



Profile of the Trinity project showing the four proposed power houses

contacted, according to the Secretary of the Interior, only PG and E indicated any desire to purchase and develop the falling water. Thus preference customers were given ample opportunity to lease the Trinity power privilege and rejected it.

Pacific Gas and Electric Co. engineers, working in cooperation with those of the Bureau of Reclamation, negotiated a partnership agreement for the development of the project wherein the PG and E would build and pay for the project's power plants and related transmission facilities and pay the federal government an average of $4,600,000 a year for the use of falling water developed by the project. In electrical terms this represents a payment of approximately 3.9 mills per kwh for the use of the falling water. Expressed in another way, the Pacific Gas and Electric Co. would pay the equivalent of $5.35 per acre-ft for falling water, which water is later sold through the Central Valley project for irrigation at approximately $3.50 per acre-ft.

The above price is based on the cost of producing a kwh in the company's most modern steam plant and as such represents the fullest possible market value of falling water to the government.

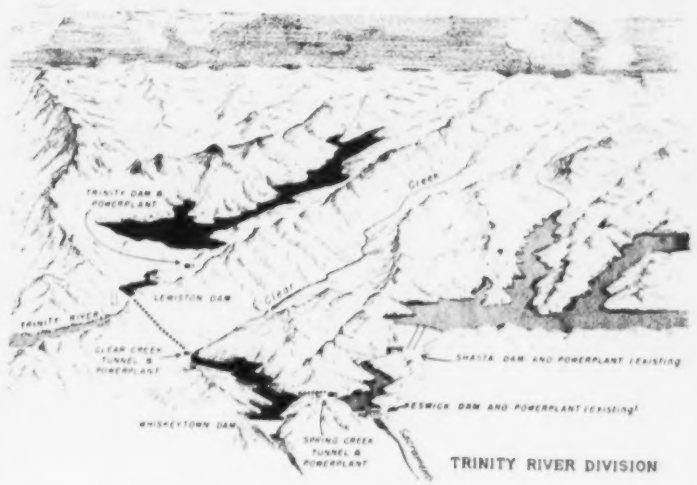
As shown in the accompanying profile, the Pacific Gas and Electric Co. would build four power plants with a total capacity of 384,600 kw, would support 450,000 kw of Central Valley project power for sale by the government to federal agencies and preference customers and would allow the government to use the company transmission facilities to serve these loads over the next 50 years. The integration of the Trinity project power into the extensive generation and transmission network of the utility would have the beneficial effect of "firming up" and utilizing all power available from falling water to the maximum beneficial effect for California water users and federal taxpayers.

Economics of the Project

The partnership proposal would provide an additional surplus of $165,000,000 net in project revenues at the end of 50 years' operation over an all-federal development. In addition, as a taxpaying partner, the Pacific Gas and Electric Co. would contribute $135,000,000 in federal, state and local taxes over the contract period. The company's estimate of tax payments is slightly higher showing that the federal government would receive $83,000,000 and state and local bodies $62,600,000. Power from the project would be distributed by PG and E without discrimination to all electric customers in its 46-county service area at rates fixed by the California Public Utilities Commission. Dollar savings under partnership over the contract period represent nearly twice the estimated cost to the government of the water project cost. Dollars thus saved could be well used to promote additional water projects to meet California's ever-mounting needs.

All-Federal Plan

Opponents of the partnership plan have raised only one objection. That is the fact that preference customers in the Sacramento Valley now served by the Central Valley project would have to pay a higher rate for future power requirements than is now enjoyed as a result of federal government subsidies of one form or another. There are only minor differences in the physical concept of the Trinity project between the all-federal and the partnership program. The total installed capacity under the all-federal program would be 369,000 kw in contrast to the PG and E's 384,600 kw. The dependable capacity and the average annual kilowatt-hour production of the project is essentially the same under either scheme. The only difference is that the Central Valley project would, under the all-federal plan, increase its dependable power supply for sale to preference customers from 450 mw to 650 mw (assuming that the Pacific Gas and Electric Co. would continue to provide the support for CVP afforded by its large integrated network). Under the all-federal plan, the U. S. government would have to dip into the treasury for an additional $56,000,000 for power plant facilities and the people of the United States and northern California would not enjoy the very



TRINITY RIVER DIVISION

Physical Data—Trinity River Project

	With Project Constructed Under Bureau of Reclamation	With Project Constructed Under Partnership Plan	
		By USBR	By PG and E
Capital Cost	$225,213,000	$168,481,000 ($56,732,000 federal savings)	$56,937,000
Power Summary—Total installed capacity, kw	369,000		384,600
Ultimate average total annual energy, mil. kwh	1130*		1153
Physical Features Trinity Dam and Reservoir—Dam height, ft.	455	455	
Reservoir capacity: Maximum, acre-ft	2,500,000	2,500,000	
Reservoir W.S. elev: Maximum, ft	2,370	2,370	
Tunnel: Diameter, ft	28	28	
Length, ft	1,494	1,494	
Trinity Power Plant—Penstocks: Number	1	1	
Diameter, ft	16	16	
Length, ft	1445	1445	
Static head: Maximum, ft	472		472
Power plant: Number units	2		2
Installed capacity, kw	96,000		98,000
Lewiston Diversion Dam—Dam height, ft	70	70	
Reservoir active capacity, acre-ft	2,630	2,630	
Reservoir W.S. elev: Maximum, ft	1,902	1,902	
Lewiston Power Plant—Penstock: Number		1	
Diameter, ft		4	
Length, ft		550	
Average static head: ft			60
Power plant: Number units			1
Installed capacity, kw			600
Clear Creek Tunnel—Diameter, ft	17.5	17.5	
Length, ft	56,600	56,600	
Capacity, cfs	3,200	3,200	
Clear Creek Power Plant—Penstocks: Number	1	1	
Diameter, ft	14.25	14.25	
Length, ft	2,000	2,000	
Static head: Maximum, ft	705		705
Power plant: Number units	2		2
Installed capacity, kw	130,000		133,000
Whiskeytown Dam and Reservoir—Dam height, ft	250*	250*	
Reservoir capacity: Maximum acre-ft	250,000	250,000	
Reservoir W.S. elev: Maximum, ft	1210	1210	
Spring Creek Tunnel—Capacity, cfs	3,600	3,600	
Tunnel No. 1: Diameter, ft	18.5	18.5	
Length, ft	8,700	8,700	
Siphon: Diameter, ft	17.0	17.0	
Length, ft	3,200	3,200	
Tunnel No. 2: Diameter, ft	18.5	18.5	
Length, ft	3,700	3,700	
Spring Creek Power Plant—Penstocks: Number	1	1	
Diameter, ft	15.5	15.5	
Length, ft	2,000	2,000	
Static head: Maximum, ft	632		632
Power plant: Number units	2		2
Installed capacity, kw	143,000		153,000
Transbasin Diversion—Average annual acre-ft	865,000		865,000

*Estimated

substantial tax income that would be paid if the electrical facilities were provided by a nonfederal agency.

Executive Vice-president Robert H. Gerdes of Pacific Gas and Electric Co. succinctly summarized the economics of partnership by saying, "There is no good reason why the people of the United States should forego $310,000,000 in revenues in order to give away $47,000,000 to a few privileged electric customers in the Central Valley."

Public and press reaction to the PG and E partnership proposal has been extremely favorable. Dissenters, as might be expected, are confined chiefly to the hard core of advocates of a nationalized power system. Approval of the partnership development of the Trinity project, in the final analysis, lies in the hands of Congress. The facts being what they are, it would appear indeed difficult to refute the recommendations of the Secretary of the Interior who concluded his report to Congress as follows:

"It appears clear from the report of the commissioner (of reclamation) that joint development would provide substantially more funds for irrigation and multipurpose development in the Central Valley project area.

"This means that the power resource of the Trinity River diversion would be developed in such a manner as to provide more benefits to the project area and to the nation as a whole. This is consistent with my view that our water resources should be developed in the manner best suited to comprehensive use of those resources.

"I am also conscious of the fact that the basic purpose of the reclamation program is the development of irrigation water supply and the reclamation of land. Electric power is generated as an incident to the basic purposes of the program. It seems to me that the development of the power resources of the Trinity River diversion under a joint proposal such as that offered here would mean that power would become a better partner of irrigation development in the Central Valley project area than under all-federal construction.

"Accordingly, I find the proposal of the Pacific Gas and Electric Co. to be acceptable generally, and recommend approval by the Congress, subject to thorough consideration of the provision for severance damages in the event the United States should exercise its election to take over the power facilities at the end of the proposed contract period."

Trend toward automation, increased electrochemical processing brings about . . .

The Resurgence of Direct Current

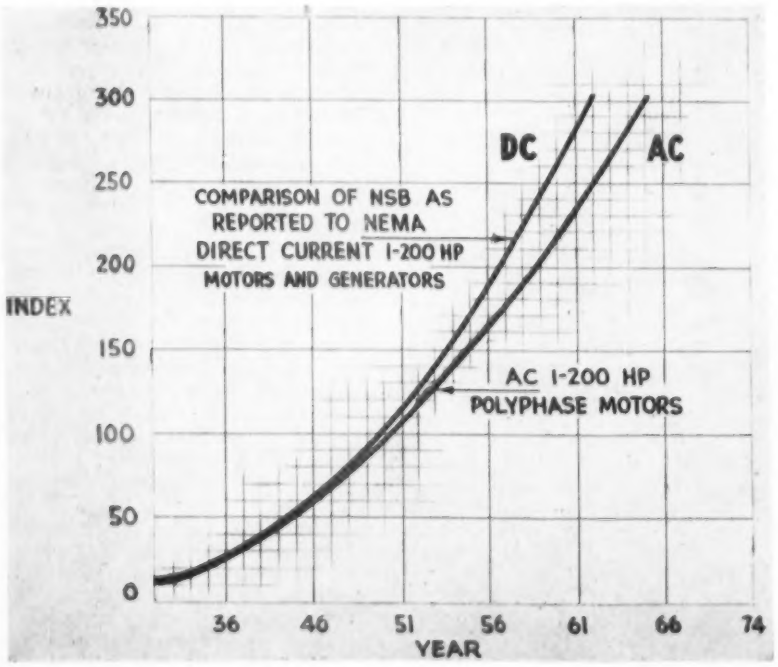
Time was when the statement that d-c was on its way out would have raised little question in any engineers club in the country. Today there is a resurgence in the use of direct current and for this reason warrants our special attention in this issue.

Semiconductors

The development of the semiconductor-type rectifier with its 90% plus efficiencies has caused industrial mechanization experts to take a new look at the d-c motor as the most economical means for obtaining variable speed. The advantages of d-c motors for these variable speed applications have never been questioned but until recently the conversion for 60-cycle plant power to a d-c voltage has been a costly, space-consuming, maintenance-requiring item. As a result mechanical and hydraulic means have come into use in areas that would be better served with d-c equipment. The technological break-through, which the semiconductor rectifiers represent, has shifted the break-even point for the use of d-c equipment. Many users, with their eyes on increased production are taking advantage of the control potential of d-c equipment.

Ease of Control

Variable speed is but one of the user advantages of d-c equipment. D-c lends itself to precise control from a great variety of transducers including torque, tension, temperature and a host of others.



NEMA figures indicate growth of d-c equipment sales relative to a-c. 1956 NEMA figures for sales in this category show d-c at $48,200,000, 21.6% of a-c sales

Heavy on the heels of the industrial user who capitalizes on the automation advantages of d-c motors is the electrochemical industry. In this industry, where electric power is an important raw material, there has been like attention to the application of the new semiconductor rectifier and continued growth as the nation's economy comes to depend more and more on the synthetics and hard-to-get nonferrous metals.

In terms of statistics, d-c kilowatthour usage has grown from an estimated 33½ billion kwh in 1946 to 61 billion in 1956. During this same period, a-c kilowatts for industrials have gone from 139 billion to 290 billion kw. This would indicate that the per cent of d-c to a-c was slipping slightly over the past decade. A study of NEMA figures relating the per cent of d-c to a-c motors sold shows a decline prior to the war with an upswing following the war. Other sources shown on the accompanying graph would indicate growth in the use of d-c equipment relative to a-c.

Rectifier Market Booms

U. S. Department of Commerce figures for the year 1947 indicate a market of $21,000,000 for mercury arc, power electron tube and "other types." The latter classification presumably refers to semiconductor and mechanical-type rectifiers. This figure does not include communication types. By 1954 this market had grown to $64,300,000 for the same equipments—a three-time gain. To estimate the 1957 market it would be necessary to add a four-million annual import plus those units that would be classified as a communication type. Add to this total (probably between 80 and 90 million) three years growth and it becomes a $100,000,000 market. This approximates a five-time growth for the 10-year period – and growing fast.

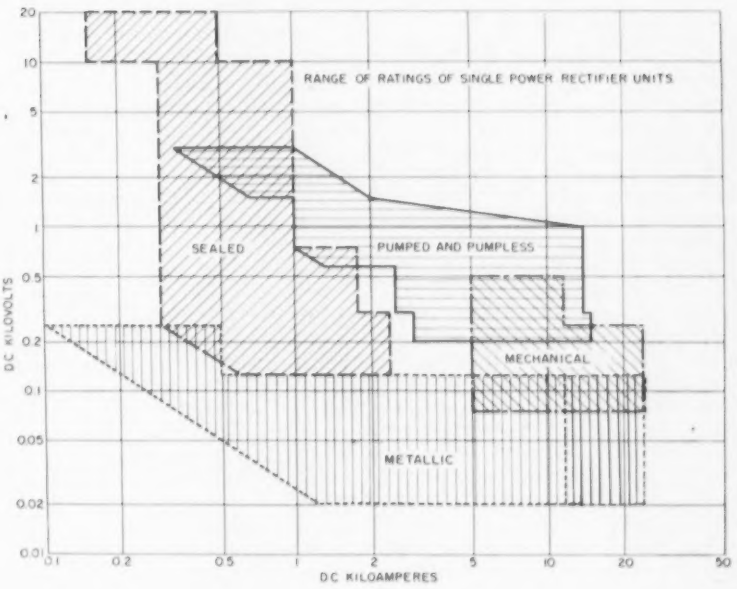
Our purpose obviously is not to rekindle the a-c–d-c debate, but to highlight for our readers the profit possibilities that have *created* the resurgence of d-c.

Recent developments have changed long-standing economic relationships between rectifiers. Here is a new look at . . .

Selection of D-C Power Sources

R. M. Crenshaw
Application Engineer
General Electric Co.
San Francisco

There are many industrial processes where direct current is the only suitable power supply. For example, gas production by electrolysis, anodizing, electroplating and controlled adjustable speed for metal rolling and finishing mills. Although d-c is seldom used in the home or in the store, it is muscle and sinew to heavy industry. Practically all of the public utility power supply available to industrial customers is 60-cycle a-c. This raises some questions. Where does this d-c power come from? What choices for obtaining it are available to the industrial user? Which is most economic on a given job?



This chart shows the effect of current and voltage in selecting a rectifier

D-C Sources

Direct current can be obtained from several sources, each with its special area of application. They are:

1. Motor-generator sets
2. Electron tube rectifiers
3. Mechanical rectifiers
4. Chemical processes
5. Semiconductor (metallic) rectifiers

Motor-Generator Sets

The early form of electric power for lighting and motors was of the d-c variety. This power was produced by direct-current generators driven by prime movers. Progress and invention developed the a-c generator and the a-c motor. The many advantages of a-c were soon apparent; these included elimination of the commutator, the larger machine capacity with higher voltages and the ability to transform voltage by magnetic induction, and thus transmit power over long distances. This soon made a-c the principal type of electric power for home and factory. *But d-c did not completely disappear!*

As industry developed, it became evident that some processes could be performed *only by d-c*. Still others could be done much *better by d-c*. Naturally the d-c generator continued in use to supply these power requirements. For many years, prime movers such as steam and gas engines were used to drive these generators. In the early days, many public utility systems generated and distributed d-c to industrial and commercial customers but these supplies have now almost completely disappeared.

The rapid development of a-c systems proved that a-c could be generated and transmitted much more readily and efficiently than d-c. Now purchased power is practically all alternating current. It then remains common practice to use an a-c motor for driving a d-c generator to obtain d-c power. Today, motor-generator sets, ranging from fractional horsepower up to many thousands of horsepower per set, are used to supply industrial processes requiring d-c power.

The synchronous converter is a modified motor-generator set in which the a-c input and d-c output use the same winding of a single machine. This type of conversion saved space and copper. It was popular for a time especially in the transportation field, but very few such machines are being built today.

The d-c generator is widely used to supply large drive motors in metal-working mills. The inherent ease of voltage adjustment by field excitation change makes it particularly suitable for rolling mills requiring a carefully controlled speed

range. A generator can be made with two or more field windings, making it responsive to several independent signals. This permits its use as a booster or regulator where the output must change rapidly from full rating positive to full rating negative. Steel mill process lines are an example. Generators have high momentary overload capacity so are quite suitable for elevator power supplies and similar loads where high peak loads and frequent load circuit faults may occur. The d-c generator requires regular maintenance and is less efficient than many of the other d-c sources.

Electron Tube Rectifiers

Electron tubes have the inherent characteristic of permitting electron flow in one direction while blocking it in the other. The output is recognized as a unidirectional current, i.e., half the a-c wave is blocked off when passed through a diode electron tube. The result is half-wave pulsating current, which has some applications in the electronic field but not for industrial power. Fortunately, it is easy to arrange several electron tubes in circuits to produce a more uniform unidirectional current where the peaks and valleys are smoothed out. This paved the way for powerful electronic rectifiers in use today. By the use of multiphase connections the electron tube can produce d-c of equivalent smoothness to that of a generator.

The mercury arc tube uses a pool cathode with an ignitor, hence is often called the ignition tube. There is also the mercury vapor tube with a heater-type cathode. The thyratron and phanotron are examples.

Most of the power rectifiers in use today are of the mercury-arc type. The mercury arc tube is capable of much higher current rating than a gas-filled or high-vacuum tube. Current in the order of hundreds of amperes is common for a sealed mercury arc tube. The current may be several thousand amperes in the large pumped or pumpless type. Each tube has a nearly constant arc drop in the order of 17.5 v. For this reason, the efficiency is better as operating voltage increases.

The electronic rectifier using mercury arc tubes has generally been applied in the voltage range from 250 to 2,500 v, but present practice seldom uses them below 400 v. The smaller sealed-tube types can go to considerably higher voltage for special applications. Normally a transformer and switchgear are combined with the rectifying tubes, cooling and control equipment in the form of a packaged power supply. Units in the order of 2,000 amp and smaller at 250 v and higher use the sealed-tube design. Larger units have, in the past, required an elaborate vacuum pumping system which meant additional space and maintenance problems. Within the past five years there has been a definite trend toward the pumpless tube, which is really an extension of the sealed-tube design. Mercury arc rectifiers show good efficiency from one-fourth load to full load. Essentially a constant-voltage device, the output voltage can be varied over a considerable range by a phase-shifting ignitor voltage.

The electrochemical industry uses very large ratings of mercury arc rectifiers. These rectifiers are well adapted to the high current continuous loads at the voltage ratings required for electrolytic cells. They have also found extensive application in the electrified transportation field. The usual arrangement is to locate rectifier stations along the right-of-way, transmitting d-c power to the moving locomotive or bus via trolley wires. One recent application has taken a different approach. The advantages of a-c transmission are obtained by taking a-c right into the moving equipment.

Several steel mill hot strip rolling mills have recently installed mercury arc rectifiers as power supply for main drive motors. The advantages are: less costly installation, high efficiency over a wide range of load, less noise and lower maintenance as compared with m-g sets.

Mechanical Rectifier

The mechanical rectifier does not

Comparison of D-C Power Sources

COMPARISON FACTOR	GERMANIUM	MECHANICAL	MERCURY-ARC
SPACE	SLIGHTLY MORE THAN MERCURY-ARC	SLIGHTLY LESS THAN MERCURY-ARC	
LIFE OF RECT. DEVICE	5% CELL FAILURES PER YEAR IMPROVING	500-5000 HRS. CONTACT LIFE IMPROVING	10-YEAR MINIMUM AVG. SERVICE PERIOD BETWEEN RECONDITIONINGS
SERVICE DEPENDABILITY	EXPECTED TO BE NEARLY AS GOOD AS MERCURY-ARC	LEAST DEPENDABLE	BEST OF ANY CONVERSION APPARATUS
MAINTENANCE	SIMPLE	COMPLEX	SIMPLE - WELL UNDERSTOOD IN INDUSTRY
OPERATION	SIMPLE - UNATTENDED	TRAINED PEOPLE REQUIRED	SIMPLE - CAN BE UNATTENDED
RECTIFIER DEVICE FAILURES	REPLACE CELL AND FUSE	DRESS OR REPLACE CONTACTS	VERY INFREQUENT. SMALLER TUBES REPLACEABLE - LARGER TUBES RECONDITIONABLE
SENSITIVITY TO VOLTAGE AND FREQUENCY	NOT SENSITIVE	VERY SENSITIVE	NOT SENSITIVE TO VOLTAGE OR ORDINARY FREQUENCY CHANGES
ARC BACK - SERVICE INTERRUPTIONS	NO	UNIT INVOLVED ALWAYS INTERRUPTED. ENTIRE SYSTEM SOMETIMES	NO
ARC BACK PROTECTION	FUSE	SHORT-CIRCUIT SWITCH	ANODE BREAKER
DEVELOPMENT STATUS	INTENSE AND INCREASING	PASSED PEAK	WELL DEVELOPED AND CONTINUING
RECTIFIER DEVICE SEVERE OVERLOAD AND SHORT CIRCUIT CAPACITY	DEFINITE DESIGN CEILING. IF EXCEEDED CAUSES DAMAGE	DEFINITE DESIGN CEILING. IF EXCEEDED CAUSES DAMAGE	INHERENTLY HIGH. IF EXCEEDED CAUSES ARC BACK WITHOUT DAMAGE
RECTIFIER DEVICE OVERVOLTAGE CAPACITY	DEFINITE DESIGN CEILING. IF EXCEEDED CAUSES DAMAGE	DEFINITE DESIGN CEILING. IF EXCEEDED CAUSES DAMAGE	INHERENTLY HIGH. IF EXCEEDED CAUSES ARC BACK WITHOUT DAMAGE
RECTIFIER DEVICE OVERTEMPERATURE CAPACITY	INHERENT CEILING. IF EXCEEDED CAUSES DAMAGE	NOT TOO SENSITIVE	BROAD OPERATING RANGE. IF EXCEEDED CAUSES ARC BACK WITHOUT DAMAGE
PARTS AND SERVICE	NO PROBLEM	POSSIBLE PROBLEMS	NO PROBLEM
SENSITIVITY TO ENVIRONMENTAL CONDITIONS	LIMITED BY SWITCHGEAR RECTIFIER DEVICES SEALED	CONTACT OPERATION SENSITIVE TO AIR IMPURITIES	LIMITED BY SWITCHGEAR RECTIFIER DEVICES SEALED
STARTING	INSTANTANEOUS	TIME-WARMUP	TIME-WARMUP
OPERATING EXPERIENCE AT HIGH VOLTAGE	VERY LITTLE	EXTENSIVE	VERY EXTENSIVE
VOLTAGE ADJUSTMENT BY PHASE CONTROL	NO	YES	YES
POWER FACTOR (F. L.)	95	CONVENTIONAL 92 GENERAL ELECTRIC 98	95 WITHOUT PHASE CONTROL
EFFICIENCY	95-96	96-97	85-96. EXCEEDS 95 FOR VOLTAGES ABOVE 500

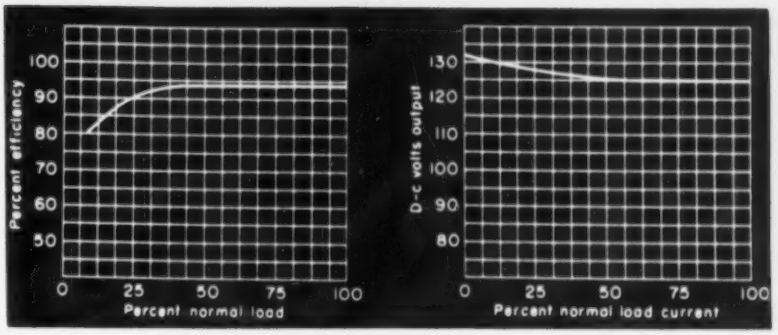
produce energy. It acts as a synchronized mechanical switch, permitting power from an a-c source to flow only during the positive half-cycle. Moving contacts, driven by a small synchronous motor, connect the proper phase connections in sequence to the d-c system so each phase conducts only during its positive half-cycle. The mechanical rectifier has been used extensively in Europe for several years. As early as 1939 the Siemens-Schuckert Co. had units in operation. In the United States, mechanical rectifiers have not been used widely, although enough units have been built and operated to obtain rather complete comparative data. Recent improvements in operating characteristics have been possible by the use of a commutating reactor having very abrupt saturation characteristics. The mechanical rectifier has the highest over-all electrical efficiency of any power-conversion equipment, but maintenance costs tend to offset this advantage. The small losses are principally in the transformer, commutating reactor and the drive motor, resulting in efficiencies of the order of 97% when operating between 100 and 500 v.

High efficiency and low installed cost are most important in the electrochemical industry, because electric power costs there are a high percentage (often 30 to 50%) of the total product cost. The principal application of these rectifiers has been for heavy electrochemical processes requiring currents from 6,000 amp on up at voltages from 100 to 500 v. The equipment is capable of limited voltage adjustment by phase control.

The equipment has many moving parts, resulting in high maintenance and objectionable noise. Although this type rectifier will continue to find some applications, it seems destined to meet considerable serious competition from the germanium and silicon rectifiers.

Other D-C Sources

D-c power, produced by chemical processes, refers to dry-cell and storage batteries. Battery sources are important in industry where mobility or reliability are of prime considerations, such as with battery-operated trucks or for close and trip duty in a substation. The fact that 1½ hp of solar energy falls on a square yard in direct sunlight has caused many people to look to this source for much of our future power. In general, we must view this source as a potential, not an actual source of industrial power.



Curves represent over-all efficiency and regulation for 75-v d-c packaged germanium power supply. Notice that both curves are flat for loads more than 35%

Semiconductor Rectifiers

Semiconductor rectifiers produce unidirectional current from a-c in the same manner as electronic devices except that no heater or arc excitation power is required. A thin wafer cut from a single crystal of extremely pure germanium, approximately the diameter of a dime, when properly alloyed with indium becomes a rectifying cell with an average half-wave rating of 83 amp.

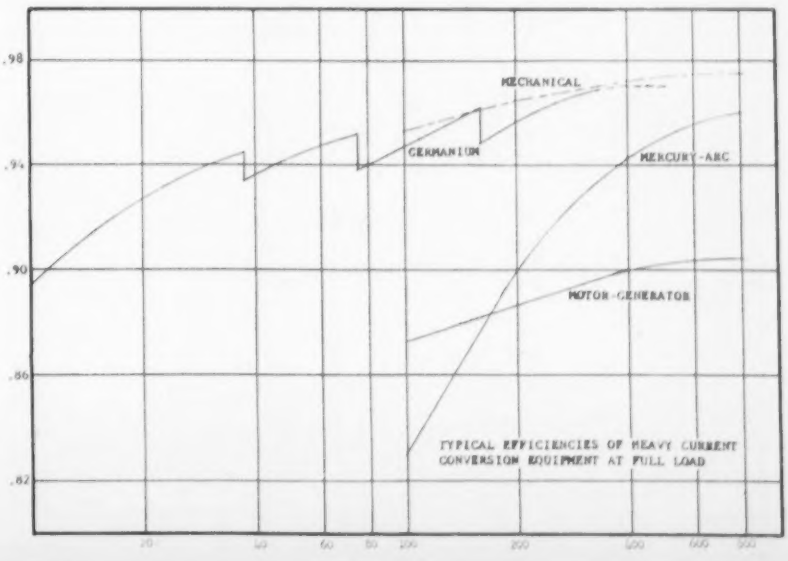
The materials most commonly used for semiconductor rectifiers are copper oxide, selenium, germanium and silicon. Copper oxide and selenium have been used throughout industry for many years. Their efficiency is somewhat less than m-g sets and the losses increase with age and temperature. Germanium and silicon are the relative newcomers to the rectifier family. In a very few years, these new elements have revolutionized the use of semiconductor rectifiers for large industrial power supplies.

Some outstanding advantages of germanium rectifiers are:

1. Good regulation as a result of small voltage drop
2. High operating efficiency (92-94%)
3. Small size, which results in small equipment
4. Higher cell voltage rating
5. Not subject to aging as with copper and selenium

A further comparative idea of size and capacity can be obtained by referring to an accompanying figure, which shows an assembly of six germanium cells connected in three-phase, full-wave bridge. This equipment, when properly cooled by forced air, is rated 250 amp, 75-v d-c, equivalent approximately to 18 kw output. This arrangement uses only one cell per arm in the bridge circuit emphasizing the high-voltage rating of a single cell. Note the staggering size and number of selenium units to do the same job. Since so few cells have such a high rating, these units will find application mainly for large current requirements. Selenium still does a good

Rectifier efficiency varies with d-c voltage as illustrated on the chart



job for intermediate loads. Typical applications are for elevator motors, excitation of synchronous motors, battery chargers and welders.

Germanium

Because of the high efficiency of this rectifier, it finds the best application in the high current, steady continuous loads of electrochemical processes. Germanium rectifiers have been installed for such applications as hydrogen gas production, aluminum anodizing, electroplating, chlorine production, copper refining and steel mill electrotinning lines. Since 1953, when the first germanium power rectifiers were installed, their use has increased much more rapidly than other types. General Electric alone has furnished or has on order more than 60,000 kw of these rectifiers, comprising over 45 installations.

The hermetically sealed cell offers excellent protection to corrosive atmospheres often present in chemical plants. The higher voltage rating of germanium rectifiers is well suited to chemical operations because the number of electrolytic cells can often be varied to suit the optimum rectifier ratings. Loads that require 75 v or less can be supplied by single-bridge circuit without using cells in series.

Voltage requirements above 75 v are supplied by using germanium cells in series for each arm of the bridge. Ratings are now being considered up to 500-v d-c. Over-all electrical efficiency—including transformer losses—up to 95% can be expected for such applications at rated voltage and full load. For high current capacities, several cells can be paralleled in each arm of the bridge. Any number of bridges can be connected in parallel to obtain total ratings of several thousand amperes.

Low-voltage plating and anodizing loads can be economically supplied by germanium rectifiers, even though the cell is operated at less than rated voltage. For plating loads in the order of 6 to 24 v, efficiency in the order of 80 to 88% can be expected and this is so much higher than obtained from selenium rectifiers that it is still an excellent application.

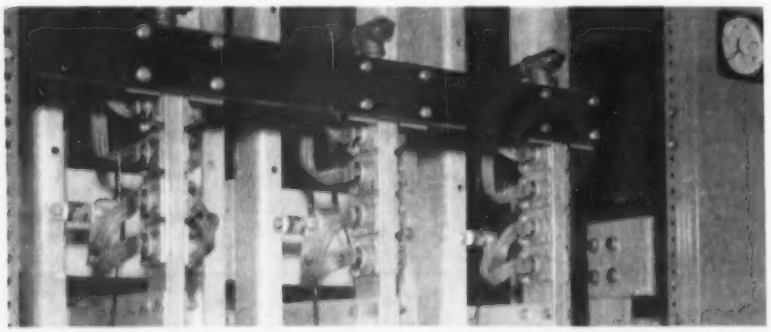
Germanium rectifiers have no inherent method of voltage adjustment similar to phase control of other types discussed above. When voltage adjustment is required, the induction voltage regulator or saturable reactor is used. Where a wide range of d-c voltage adjustment is required, the saturable reactor is usually less expensive. It offers a full range of voltage adjustment and is adaptable to automatic regulating schemes. In larger ratings the induction regulator is less expensive if the range of d-c voltage adjustment is in the order of 20 or 30%. Automatic control of d-c current or voltage is a standard feature.

Silicon

Silicon is the most recent element to be used in a semiconductor rectifier. In many ways, the silicon rectifier resembles germanium. When silicon is combined with proper alloys to produce rectifying properties, it exhibits two very desirable qualities: (1) when using a single cell per arm in a three-phase bridge, the output voltage can go up to 165 v compared with 75 v for germanium; (2) the ability to withstand higher temperatures. The maximum cell junction temperature of silicon is 200 C. Germanium is limited to about 65 C. The advantage of a minimum number of cells in series and higher temperature operation is immediately apparent. The forward voltage drop and forward loss of a silicon cell is about 1¾ times that of germanium of equivalent current density. When compared on an equal voltage rating, this shows an efficiency advantage for germanium. But, recalling that a silicon cell has a voltage rating more than twice as much as germanium, this rectifier can be expected to operate just as efficiently as germanium when applied near its voltage rating.

Development of silicon has been slowed somewhat because of metallurgical difficulties in producing pure crystals of the metal. High current cells having approximately the same current rating as germanium of equivalent size are now being produced. Several trial power supplies are now in use; however, silicon rectifiers are still somewhat in the experimental stage so far as heavy power supplies are concerned. Several companies have assembled the silicon power diode into various forms of power supplies for aircraft engine starting, battery charging and shop supplies. It is expected that larger power supplies will soon be used and silicon will find its place in the application along with germanium.

Recent developments in a-c to d-c conversion equipments make it possible to utilize the benefits of d-c power at low cost. But the key to doing this is to put the right equipment on the job.



Bottom view shows packaged rectifier equipment with transformers, filter capacitors, resistors, fuses and instruments. Top view shows piping connection to buses for liquid cooling

April, 1957—Electrical West

A maintenance foreman wonders if his electrical equipment will get him through the rush season. A utility operator is concerned about an ancient generator. A distribution engineer suspects that an underground cable has been damaged. How about . . .

Portable d-c test equipment can be used to test insulation without damaging it

Your Insulation — Will It Hold?

Otis H. Wells
Westinghouse Electric Corp.
San Francisco

and

G. Leslie Hill
Hill Research
Oakland

Such a question illustrates the importance and great economic advantage of being able simply and economically to test equipments and determine the integrity of its insulation. Present-day a-c tests oftentimes have the limitations of giving a "go or no-go" answer with the attendant disadvantage that a no-go answer will have damaged the equipment so that immediate repairs must be made before the equipment can be returned to service.

There is a device and technique of testing insulation which many power companies and some industrial users have used with remarkable success. It is the d-c high potential insulation test method. The purpose of this article is to introduce this method to the readers of ELECTRICAL WEST by showing how it can be applied as a diagnostic instrument for the maintenance and evaluation of industrial and commercial electrical equipment. The use of d-c potential for maintenance and testing has been applied to a wide range of electrical equipment including large generators, motors, bushings, cables, porcelain insulators. An unusual application of this technique is the testing of glass-lined pipes in chemical and food industries.

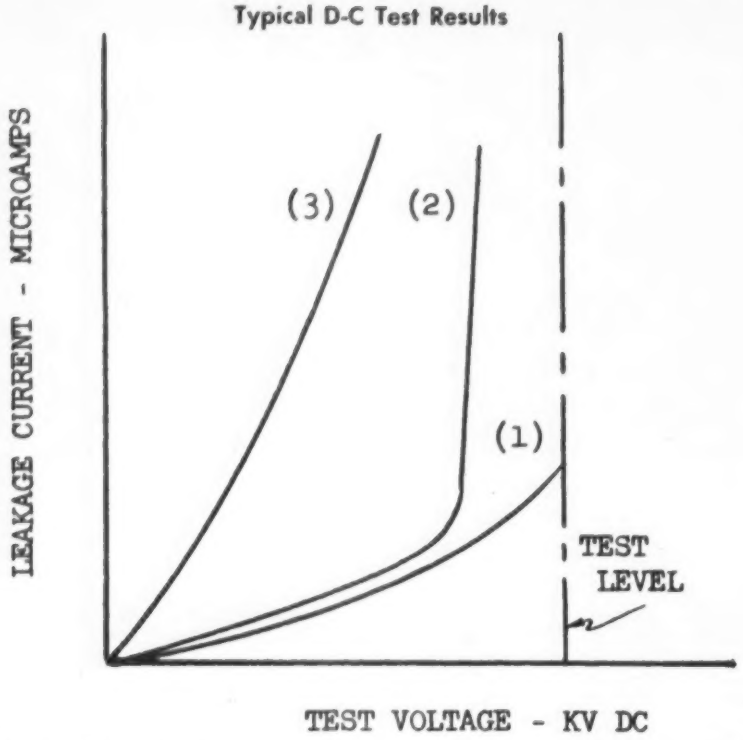
Leakage Current Measured

D-c testing of insulation is simply the application of direct-current potential, usually from an electronic rectifier, with instruments that measure the d-c potential applied to the test piece and the leakage current. A study of the electrical phenomena connected with d-c testing shows that d-c current has several components, capacity current, polarization current and leakage current. We are interested in the leakage current only. Ability to measure this current is one of the real advantages of d-c testing. When testing with an alternating-current potential, the leakage current which indicates the condition of the insulation is a very small component of the total (charging) current. Since this component cannot be separated and read on the test instruments, the test engineer has no warning when he is near the puncture point and may oftentimes damage the insulation when he only intends to check its condition.

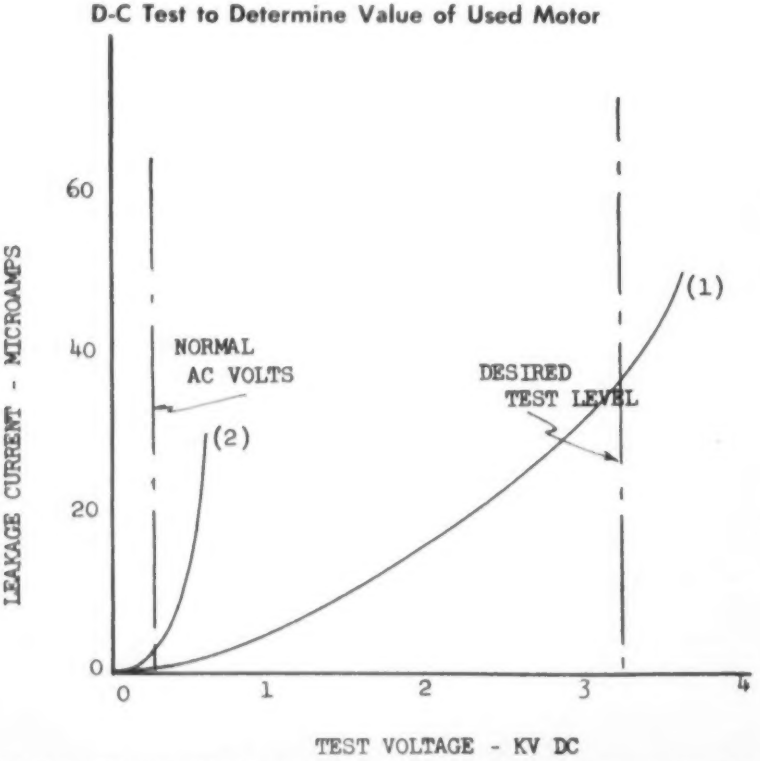
With voltage and current indicated, the insulation resistance can be determined by applying Ohm's law. D-c testing then is in effect a megger test but at a potential somewhat higher than the normal operating voltage. This provides for searching power to detect incipient weaknesses in the insulation in addition to measuring the insulation strength quantitatively. The long-established practice of the industry as outlined in AIEE, ASA and NEMA standards is that all electrical equipment manufactured shall be tested on completion of its manufacture by applying an overpotential test from a rated frequency source at a value determined by its normal operating voltage.

Limitations of A-C

There are several drawbacks to the alternating current method of testing. First, it requires large expensive equipment to make this test, particularly on large apparatus. Second, it has been proved and is generally accepted that such tests have an accumulative, destructive action on insulation. Third, the test results are not qualitative, they simply indicate the test was successful or unsuccessful. The d-c testing technique,



(1) Insulation good, clean and dry, in good repair. Test carried out to predetermined level; (2) insulation requires maintenance to reach required test level; (3) insulation has high leakage, usually moist and could be dirty—clean and bake



(1) Motor 8½ years old, clean and dry, a good buy; (2) same age motor—poor buy

while not an exact science, does not have these disadvantages.

Research on laboratory samples and actual field experience indicates that it requires a d-c potential of 1.6 times an a-c potential to develop an equivalent searching power. The applicable d-c test voltage then would be 1.6 times the a-c test potential applicable under present standards. Present standards require that new rotating power apparatus would stand a test voltage of two times normal voltage plus 1,000 for one minute. This is frequently referred to as the standard AIEE test. All subsequent tests on new apparatus are derated by factor of .75. Usually repaired apparatus is tested at .66 times the original test voltage. Further, tests on machines of 25 years of age or more may be derated by an additional .75 to .80 factor. On large apparatus many operations consider it good practice to apply a preliminary test of 1.15% of the standard AIEE test to individual coils during a rewind. This is a momentary test and should a coil be damaged during installation it can be detected and replaced during the rewind at a minimum of expense.

The purpose of a dielectric test on insulation is to determine whether or not its strength is sufficiently high to insure the degree of reliability required.

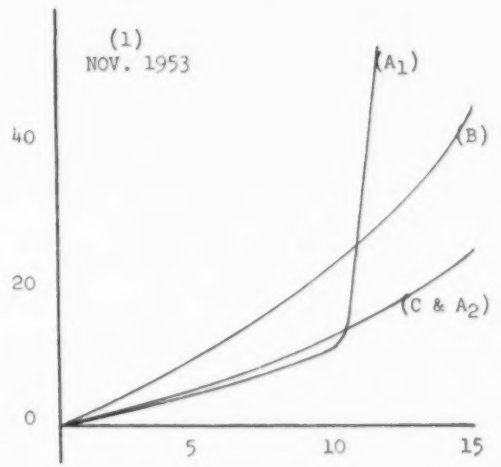
It is best for tests to be made at a time when the operation schedule permits immediate repair, although the test can usually be conducted without an insulation breakdown. If the test indicates a rewind is needed, the unit may be placed in service with a calculated risk of failure while the repair materials are obtained. There are a number of ways to conduct a d-c high potential test. The following method has been successfully used by many operators.

Preliminary Steps

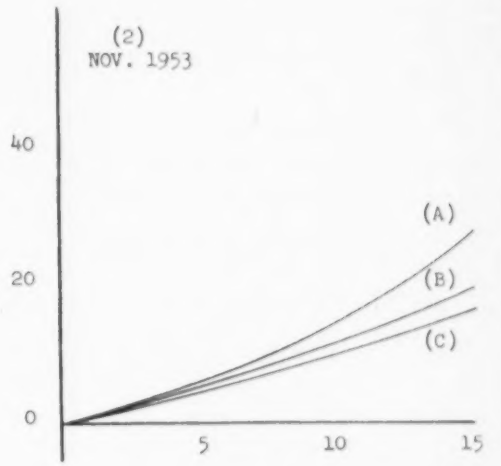
We will consider the equipment being tested as the main windings of a motor or generator.

This procedure should be a guide as to how to test the insulation on other equipment. The apparatus to be tested should be made available as soon as possible after being removed from service, but preferably after being allowed to cool to room temperature. The temperature of the winding, the ambient temperature and the relative humidity should be recorded. It is feasible and sometimes desirable to test the motor or generator together with its associated power cables. Potential transformers should be removed

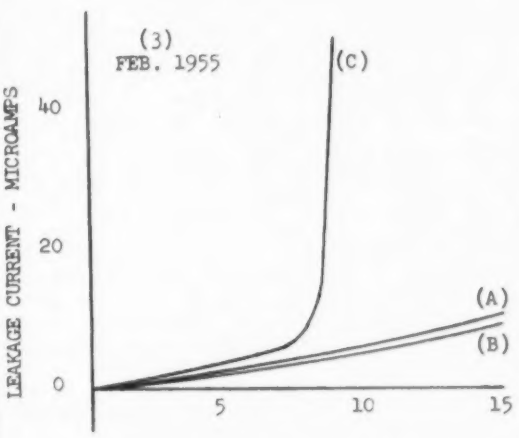
Case History of 15,000-kva, 6.6-kv Generator



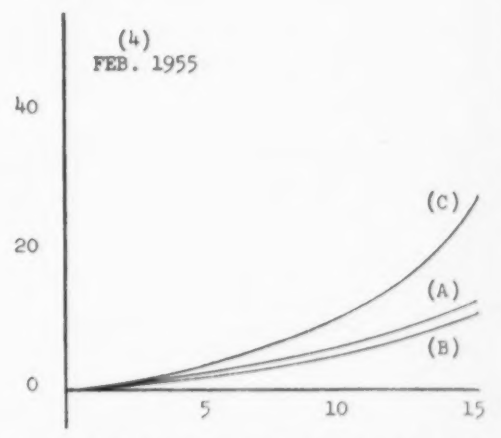
(A_1) Winding failure (on test); (B_1) insulation good but relatively dirty; (C) insulation good; (A_2) after repair (coincides with C)



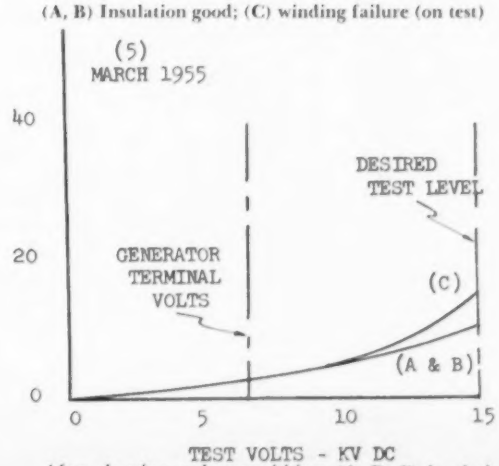
After repair and cleaning: (A, B, C) insulation good



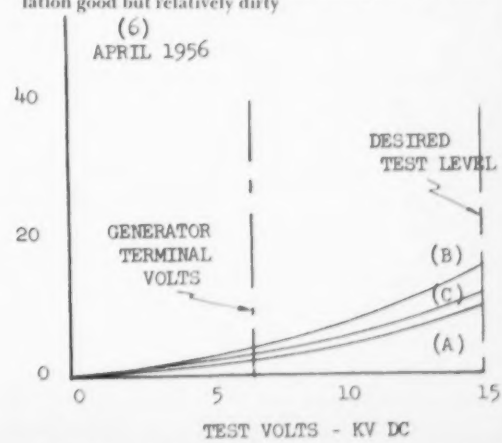
(A, B) Insulation good; (C) winding failure (on test)



After winding repair: (A, B) insulation good; (C) insulation good but relatively dirty



After cleaning and revarnishing: (A, B, C) insulation good



(A, B, C) Insulation good, no maintenance required at this time

from the circuit for most are connected line-to-ground and this would result in a false indication of ground. All thermocouples, resistance temperature detectors and current transformer secondaries, as well as the test instrument case, should be grounded to protect both personnel and equipment.

Test Procedure

The next step is to obtain a general idea of condition of the insulation on the complete winding making a conventional megger test, preferably determining the polarization index. Assured that the winding is not dead grounded, proceed to apply potential from the d-c test set in steps. Make the first step 10% of the selected test voltage. Observe the current flowing which will have a decreasing value while the voltage is maintained and hold that voltage steady until the current stabilizes, i.e., stops dropping in value. This usually requires several minutes at each step. Proceed to increase the voltage in 10% steps to 50% and then by 5% steps to 75% allowing the current to stabilize. Recording the current and voltage at each step before proceeding to the next. Now, raise the test voltage from 75 to 100% in one continuous step but observing the current carefully being prepared to remove the test voltage immediately should "run away" leakage occur. When 100% voltage is reached, record the time accurately for one minute and then decrease the voltage gradually as soon as the leakage current has been read at the end of the one-minute interval. On units with more than one winding it is the usual practice to test all windings together to ground and repeat testing each phase or winding separately with the others grounded. This checks the insulation integrity between windings as well as to ground. *Be sure to ground machine winding for at least one-half hour after testing to prevent an electrostatic charge from reappearing due to relaxation.* It is usually necessayr to ground cables for a longer period of time to prevent the recovery of the electrostatic charge. Recovery potentials hazardous to life may appear if the windings are not properly discharged.

Comparison of A-C and D-C Testing Methods

A-C High Potential Testing	D-C High Potential Testing
1. It is an AIEE standard.	1. It is an AIEE *proposed* standard.
2. This method of testing has "searching" value for detecting dielectric weaknesses. Test results show that the insulation either has withstood the test or failed. No qualitative analysis.	2. This test is equally searching as the a-c test and in addition shows the condition of the insulation qualitatively. Changes in insulation values, either an improvement or a degradation, since the last previous tests are evident. That is, the effect of cleaning, baking, as well as the effects of accumulation of dirt, moisture and physical damage are shown qualitatively.
3. If the insulation is weak, it is detected by a breakdown which must be repaired before replacing the unit in service.	3. Insulation weaknesses are shown in the test results, generally without breakdown (approximately 95 out of 100 cases), enabling repairs to be made when convenient or opportune.
4. Setup and test time is in the order of 20 minutes to an hour (a large machine).	4. Setup and test time is in the order of one to four hours (a large machine).
5. The equipment is heavy and requires a power capacity of 5 to 300 kva.	5. The equipment is light, easily handled by two men and requires 100-va power supply.
6. Requires a power supply regulated to 2-3%.	6. Requires a power supply regulated to .1% or better.
7. Test set costs range $500 to $5,000, depending on the voltage and kva rating.	7. Test set costs approximately $1,000 to $2,500 for ratings to 50 kv.
8. Deterioration of insulation results from the effects of the test voltage and is appreciable and accumulative from one test to the next.	8. Damage to insulation is negligible.
9. Corona discharge may be observed, detected and located.	9. Does not lend itself to corona detection.
10. The voltage stress on the insulation is nearer to service conditions.	10. The voltage stress on the insulation varies from service conditions in the winding end turns.

Testing Fields

When testing a field winding it may be well to make a test including the wiring to the machine if it is desired by the operator, but an additional test should then be made on the field alone including the collector rings.

The plot of the data, leakage current and test voltage will reveal a great deal of information that cannot be interpreted from tabulated data.

Maintenance Tool

It is the function of maintenance departments to keep the plant equipment operating without delays because of equipment failure. D-c testing is a tool which can be used effectively to eliminate equipment outage due to insulation failure to ground or interphase. Properly administered, the need for cleaning, rejuvenating and rewinding equipment can be predetermined and a maintenance schedule set up that is compatible with the maximum effective production schedules of the plant.

This board, 2x4 ft, was 10 scraps before going to . . .

The Glue Pot

Before the "glue pot" started functioning, the material was just scrap. Today some of the wood comes from the dry resorter where defects were cut off the boards on the way from the dryer to the planer. They don't look like much, odd pieces two to four feet in length.

Another source is the green conveyor, which carries scrap from the sawmill to the burner. These pieces are from 14 in. to four feet. Just scrap!

With the glue pot functioning, these worthless sticks are kiln dried to 10% moisture content, planed and ripped to 6-, 8- and 10-in. widths, and fed into the gluing machine.

In the gluing machine it is finger glued, end to end, pressed together and dielectrically cured, and extruded from the gluing machine as finished lumber at the rate of 40 to 50 ft per minute. After eight hours of operation, the Hammond Lumber Co. mill at Samoa, Calif., produces between 8,000 and 10,000 fbm marketable lumber.

Any Width—Any Length

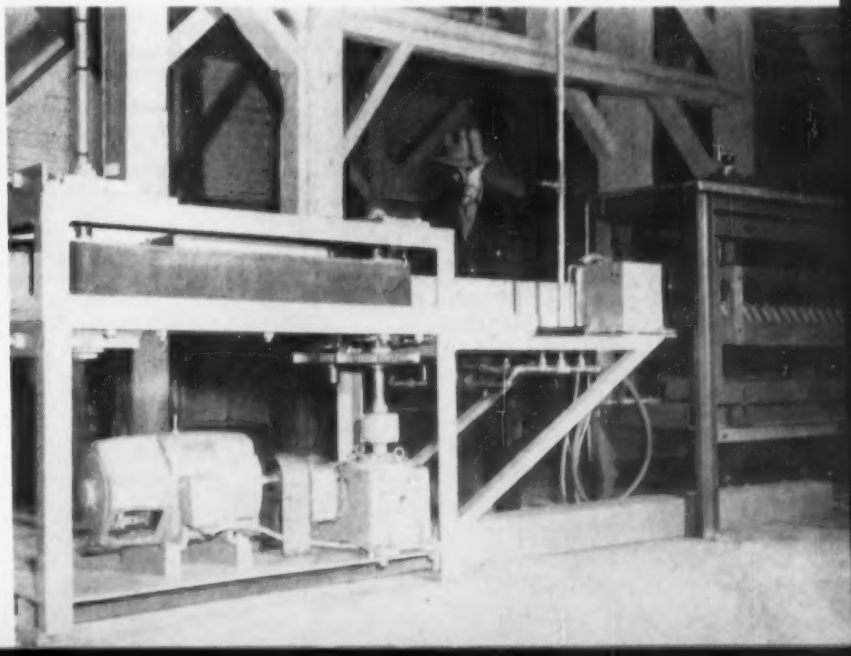
In another operation, 6-, 8- and 10-in. lengths may be edge-glued, giving widths up to 24 in. and lengths to 24 ft. The boards are as strong as ordinary boards and can be used for any purpose, inside or out, without regard to their scrap-pile heritage.

The evolution of the gluing machine has been an interesting one. The company began work with finger gluing in 1951 and by 1953 was marketing a product. Prior to last spring, the gluing machine was powered by a hydraulic system, which was unsatisfactory for several reasons. Its maximum capacity was 32 ft per minute and it was unable to accommodate 1x10 boards. It was complicated with valves, pipelines, hot and dirty, and many boards were ruined by soiling with oil. Powering the system was a 20-hp motor.

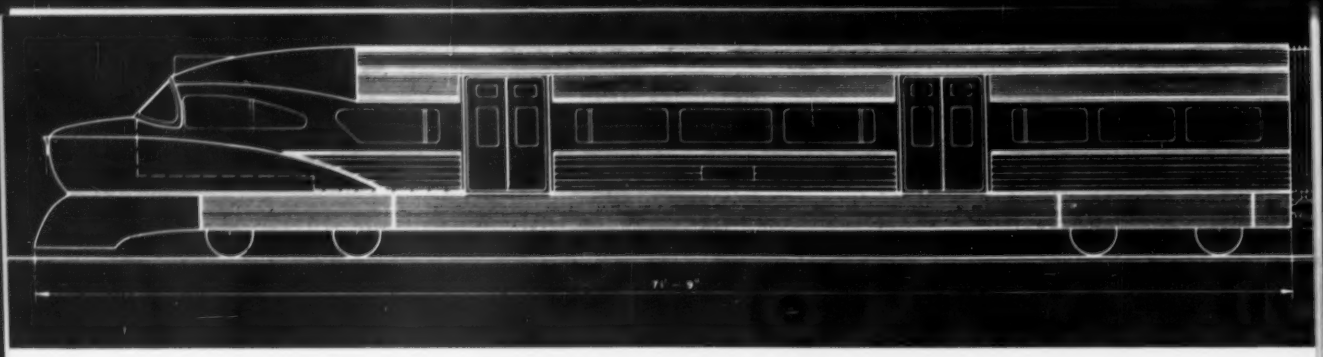
Less Power Need With D-C

On second look, it was decided to study an electrically driven d-c variable-speed setup. A 3-hp unit with a two-to-one speed range by field control was selected because it would provide constant horsepower over speed range with further reduction in speed obtainable by armature voltage control.

Direct current is applied to the unit by a power package that includes an a-c d-c motor-generator set, an exciter to provide excitation for both the generator and motor, and the drive control system. From his station, the operator controls the drive through its entire speed range by a single dial located at his fingertips. People who think you can't make a silk purse out of a sow's ear would get a real start watching the glue pot operate.



Sapwood at the joint silhouettes the finger-glued cross section which gives the finished board strength equal to a clear board. Right, Joe De Fino watches as the glue pot shapes the ends, glues, compresses and cures the boards by electronic heating. The end product can be used inside or out since the glue is impervious to water and weather.



One of the pressing growth problems the West faces is that of getting to and from work. What will we do in 1975 when many of our Western cities will have doubled in size? In San Francisco extensive studies have been made, which indicate that . . .

Rapid Transit Is the Answer

In an age when Americans point with pride to the 40-hour week, the result of their genius for production, millions of Americans have to add six, eight and ten jostling, wattless hours as "commute time." During the 10 years since the war, we have lived in the hope that the ever more costly million-dollar-a-mile freeways would be the answer. They haven't been. Even where freeways are adequate, the cities have been unable to accommodate the cars and traffic jams and parking problems have been a plague.

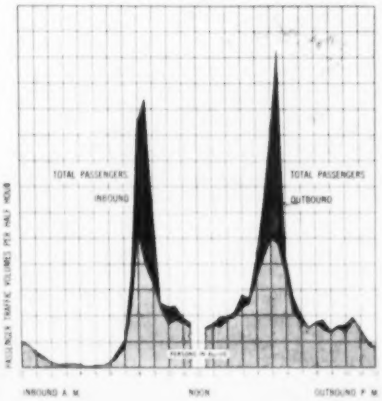
To study these problems, the California State Legislature appointed a San Francisco Bay area rapid transit commission to study the problem. The problem it studied was this: *What is the fastest way to move large numbers of people?* This statement of the problem precludes the possibility of doing the job by moving large quantities of automobiles.

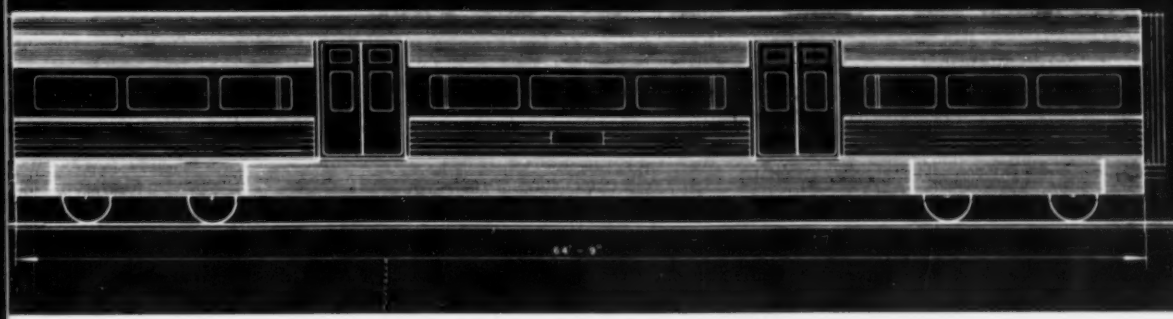
The concept of planning the transit medium for more than three million people for 80-odd cities and for nine important counties would require a big plan, a bold plan. It would require the highest caliber of study from the technical and transportation viewpoints, as well as the financial viewpoint. It would ultimately require state legislation to make such a thing possible. The study was undertaken by the partnership of Parsons, Brinckerhoff, Hall & Macdonald, who in turn retained consultants, Adams, Howard & Greeley of Boston; and transit engineers, Gibbs & Hill, to assist in the study. These firms in two years ran the gamut from helicopters to monorail and have made recommendations, which set forth a workable program for rapidly moving people.

What Is Rapid Transit?

The commission proposes putting mass rapid transit in competition with the automobile as the least cost, the most desirable, fastest means of getting to and from work. Wooing commuters from their automobiles will require first-class service indeed. Comfortable seats are a must. Average speeds will be 45 miles per hour, including station stops. This means top speeds of 70 to 75 miles per hour. Service — maximum rush-hour waiting periods of 90 seconds are planned with maximum off-peak waiting of 15 minutes. Service so good a timetable would not be necessary. Interurban stations to be located every two to three miles at points that can be conveniently reached by travelers over uncongested roads and highways, and have ample parking facilities and interchange with community transit systems. City stations must be within two or three blocks walking distance of the centers of employment. In short, no commuter will change his habits without assurance of increased comfort, increased speed, increased convenience and increased safety.

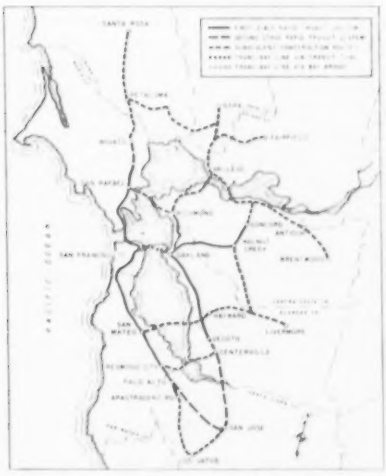
Expressed in picture or curve form, a traffic jam is a traffic jam. The photo to left shows the Oakland Bay Bridge during the evening rush. Notice that the left lane is uncrowded. Curve (right) shows the need for a peaking commute system



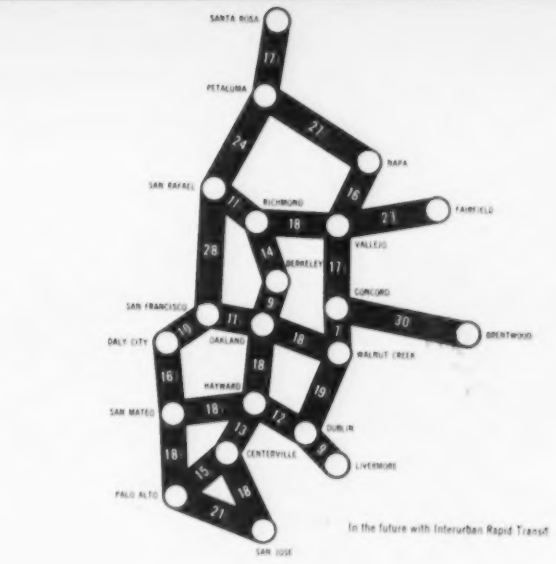


The San Francisco Plan

In the San Francisco area, the physical arrangement to accomplish these objectives are 360 miles of double track, grade separated, electrified rail facilities, using modern high-speed lightweight equipment. A first stage of construction of 123 miles, as shown in Fig. 1, would connect the urban centers of six counties. Of these 123 miles, approximately 21 miles would be underground, 71 miles on elevated structures, including the Golden Gate Bridge crossing, and 31 miles on the surface. A principal feature and vital link in the first-stage construction program is a three-point, eight-mile long, transbay subaqueous tunnel connecting San Francisco and Oakland. Of equal importance are the 10 miles of subways and underground stations in the highly developed downtown areas of San Francisco and Oakland. The elevated sections include 19 miles of elevated lines in suburban



Source: Parsons, Brinckerhoff, Hall & Macdonald



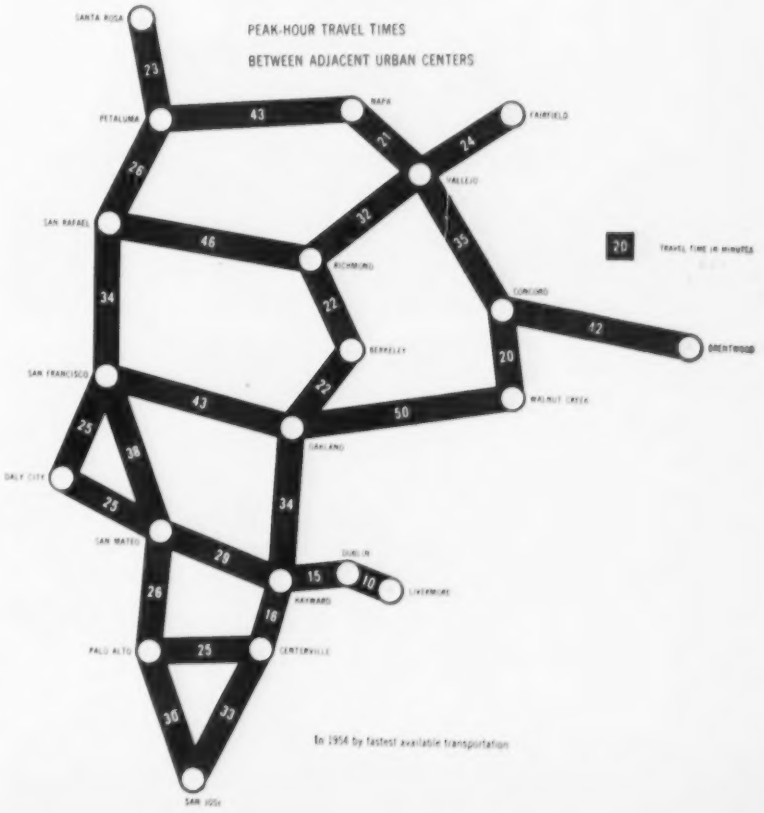
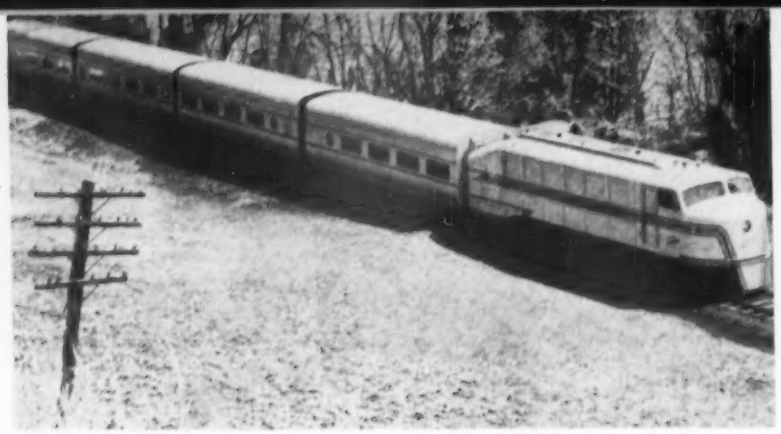
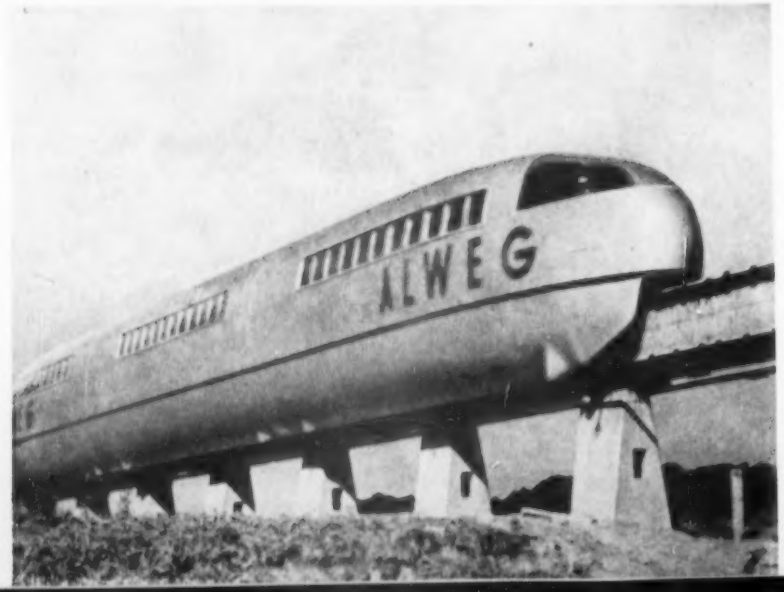


Fig. 1—Above, shows the proposed SF Bay area rapid transit system. To the right is a scale drawing showing how the area would shrink with adequate transit service. SF - Oakland service would improve from 43 to 11½ minutes





streets, six miles in freeways, 16 miles over railroad rights-of-way and 28 miles on private rights-of-way. Most of the 31 miles of projected surface lines are located at the outlying points of the initial transit system.

Second- and third-stage additions to the basic scheme will come as the population requirements of the outlying areas demand service.

An accompanying figure, drawn to scale, demonstrates graphically how the area would shrink by using the higher-speed transit equipment.

The Rolling Stock

The recommendatoins of the transit commission called for rail equipment similar in appearance to the very familiar "electric train." Appearance is where the similarity between familiar electric trains and the rapid transit system ceases. In areas where there are modern rail equipments capable of performance specified, the roadbeds and traffic situations do not allow the speeds that would be required of a present-day rapid transit system.

As a result, while the equipment specified is available and has proved performance there is nowhere in America a system comparable to that which is proposed.

There has been much technical interest in monorail trains, duorail suspended trains, the Talgo train, pneumatic-tired rail cars, conveyor systems and the like. It would seem to be to the credit of the planning group that they set forth the basic nature of the system, thereby ruling out monorail or suspended trains as uneconomic but leaving room in the framework of the system for the adoption of improved equipment within the train itself.

In the area of possibilities are a-c traction equipment, coupled with a torque converter, an a-c transmission and pickup with conversion to d-c on the train, and several schemes for applying pneumatic tires to keep down the noise level of the equipment.

1½ Billion—Can We Afford It?

As a further lure to the automo-

Typical of the systems studied were the Talgo train (top), a lightweight unit with two-wheel undercarriage. The suspended monorail at Wuppertal, Germany, averages 17 mph. This train is 56 years old. Below, the Alweg is an experimental supported monorail with design speeds up to 80 mph and horizontal and vertical rubber tires

COMPLETE D.C.	A.C. RECTIFIED TO D.C.	A.C. COMMUTATOR MOTOR	WOUND ROTOR MOTOR	SQUIRREL CAGE MOTOR WITH TORQUE CONVERTER	SQUIRREL CAGE MOTOR
ADVANTAGES				**ADVANTAGES**	
1. Lightest weight combination of equipment and car. 2. Least amount of control devices and weight. 3. Proven simple series—parallel control system. 4. Reliable D.C. series motor. 5. Full dynamic braking. 6. Most economical from an investment and operating standpoint. 7. No transformer or "step down" equipment required.	1. A.C. Distribution with 70% power factor is more efficient than straight D.C. Power factor at running is 85-90%. 2. Reliable D.C. series motor. 3. Full dynamic braking.	1. A.C. distribution system. 2. Average system power factor is 70-75%.	1. A.C. distribution system with no large transformer required on the car. Transmission voltage is motor voltage.	1. A.C. distribution system with no large transformer required on the car. Transmission voltage is motor voltage. 2. Motor is of simple rugged construction. Minimum of maintenance. 3. No commutation problem. 4. Torque converter provides high starting torque.	1. A.C. distribution system with no large transformer required on the car. Transmission voltage is motor voltage. 2. Motor is of simple rugged construction. Minimum of maintenance. 3. No commutation problem.
DISADVANTAGES				**DISADVANTAGES**	
1. Low voltage transmission. 2. Commutator motor. 3. Higher cost for installation of distribution system.	1. More control means more maintenance. 2. Possible phase unbalance which of excessive, necessitates additional correction apparatus at substations. This means more cost. 3. Commutator motor.	1. More control means more maintenance. 2. A.C. commutator motor demands higher maintenance. 3. Possible phase unbalance, meaning more substation equipment and cost. 4. Dynamic braking possible, however air brakes or other type may prove more economical. 5. Starting power factor is 30%.	1. Increased maintenance. 2. Braking done by "plugging" which consumes power. Not reliable if power interrupted. 3. Large wheels mean higher center of gravity. 4. Three phase collection is not adaptable to high speed transit. Turnouts, switching operations, and crossovers greatly increase impracticability. If a rail pick up were used, substations would be required 4 times as often as a comparable D.C. system. 5. High losses occur below synchronous speed. 6. Poor speed regulation. 7. Duty cycle of accelerating and decelerating periods with short running time not application for motor.	1. Three phase collection. If rail pick up were used, substations would be required 4 times as often as a comparable D.C. system. 2. No dynamic braking. Must be done by air, track, or disc type. 3. Operating converter at variable input speeds is very inefficient. 4. Speed control for motor is quite complex and would require more detail than a D.C. system. 5. Single phase power would give pulsative motor size as well as the design being questionable. 6. High losses occur below synchronous speed. 7. Four torque converters are additional components to maintain.	1. Three phase collection. If a rail pick up were used, substations would be required 4 times as often as a comparable D.C. system. 2. No dynamic braking. Would have to be some "outside" system. 3. Speed control for this type motor is not generally done. 4. Sustained speeds below synchronous give high losses. 5. Motor specifically designed for long running periods with short starting and stopping duty. 6. Minimum maintenance of motor does not justify inefficient power consumption. 7. Single phase power would increase motor size 50-70% and further complicate the control.

Technical interest over the type of motive power can best be evaluated by considering the pros and cons of each plan

bile commuter, proposed fare schedules are based on the premise that rapid transit transportation must be financially attractive. Revenue forecasts indicate that income would be sufficient to pay all operating expenses and to write off the cost of the transit vehicles. *The basic question then is whether savings to the people, the businesses and the communities in the Bay area would be sufficient to offset the* $716,000,000 *first-stage system investment and the* $1,545,000,000 *total system cost.*

Stanford Research Institute estimates indicate that the people of San Francisco Bay area would be required to furnish nearly $31,000,000 annually for interest and amortization of capital costs for the first-stage construction over and above income from revenues. This is no small sum. Let us look at it in relation to total Bay area costs for other important and necessary services:

Government	$ 69,000,000
Protection	77,000,000
Health and sanitation	24,000,000
Highways	45,000,000
Recreation	22,000,000
Charity and correction	126,000,000
Schools	153,000,000

People to Save

Let us consider also the value of the benefits to be obtained by raising $31,000,000 annually for a rapid transit system. From the individual point of view, reduced portal-to-portal time would result in an annual saving of 11,000,000 man-hours for transit patrons. Perhaps that much again for people who would have to use their automobiles over freeways, which then would be free of congestion. Evaluated at any reasonable average wage figure, this item alone would more than repay the $31,000,000 public commitment. Add to this the value of the lives saved on the accident-proof transit system. Viewed in another light, $31,000,000 is about $20 a year per automobile owner. In this past year automobile insurance rates increased nearly $20 per owner, which was attributed mainly to the growing costs of traffic accidents. How much would rapid transit reduce insurance rates?

Cities Save

From the point of view of the cities involved, there are benefits real, though difficult to evaluate. A rapid transit system has the capability of moving from 24,000 to 40,000 passengers per lane. The same lane, devoted to passenger cars, can only move one-tenth as many people. It becomes clear then that doing a mass transportation job with freeways takes many times the space and money to do a given job. The space thus used is lost property value, lost tax income for cities. In addition, it is generally agreed that the rapid transit approach will help solve noise and air pollution problems that are acute in many of our cities.

Good for Business

From the business point of view, business growth of any metropolitan area is enhanced by the availability of a large, flexible, highly mobile labor supply. To the electrical business, a rapid transit system would mean more business during construction as well as a 100,000-kw or more peak load requirement. A rather sizable extra benefit for rapid transit as proposed in the Bay area would be its effect on the requirements for highways, which in the Bay area means multimillion-dollar bridges. As an example, it is generally agreed that construction of a rapid transit system, utilizing a $71,000,000 subaqueous tunnel from San Francisco to Oakland, would delay the requirement for a second Bay bridge costing more than $300,000,000 for 15 years. The point is clearly: Can we afford *not* to have rapid transit?

In the West big mountains, big dams and big bridges are our heritage. San Francisco has planned big—will it act big?

Frank Collopy and Joe Blazer examine one of the anodes used in crop experiments

D-C Ups Farm Output

Direct-current treatment of soil to combat alkali salts and hard water-resistant patches is producing results in central Arizona.

Experiments by Collopy Electro-Soil Co. with cooperation of Arizona Public Service Co. and the Salt River Valley Water Users Assn. have resulted in deeper soil penetration and reduction of damage by nematodes and other crop pests.

The process, developed by Joseph and Frank Collopy, places electrodes at the edges of fields and low-voltage d-c electricity is passed through the soil for long periods.

Eight tests are being carried on in Arizona on such crops as lettuce, melons, citrus, wheat and other grains.

Increases Penetration

Most dramatic results were obtained on an alkali-laden field at Tollesen. Nine annode pipes of scrap metal were driven 4 ft into the ground 30 ft apart at one edge of the field. Cathodes, 1 in. in diameter were placed at the opposite side. D-c voltage between 62 and 65 v was turned on in December 1955. Harmless to humans, even during irrigation periods, the current has remained on since.

With planting of fall lettuce, the land began taking water as it never did before. An untreated adjoining field took 36 hours to irrigate. But the electrified field took 72 hours to saturate. Bore samples showed water penetration to a depth of 7 ft through hardpan clays.

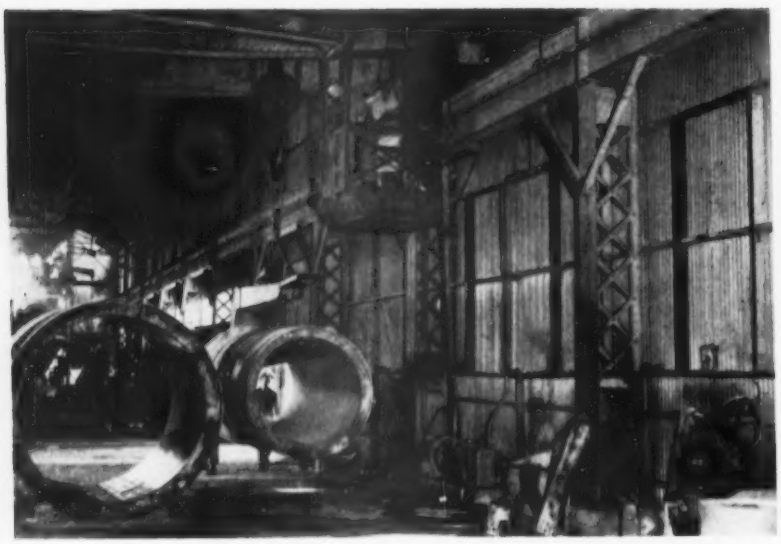
Pays Off in Produce

Yield on the treated area was 105 cartons per acre more than surrounding acreage. The treated land, previously worst on the farm, produced 31.5% more lettuce than untreated land. Cost of electricity for the year was $156.

A 10-acre stand of Cardinal grapes yielded more than double previous pickings after land was treated.

How is this for a potential load builder?

D-C for Gentle Lift



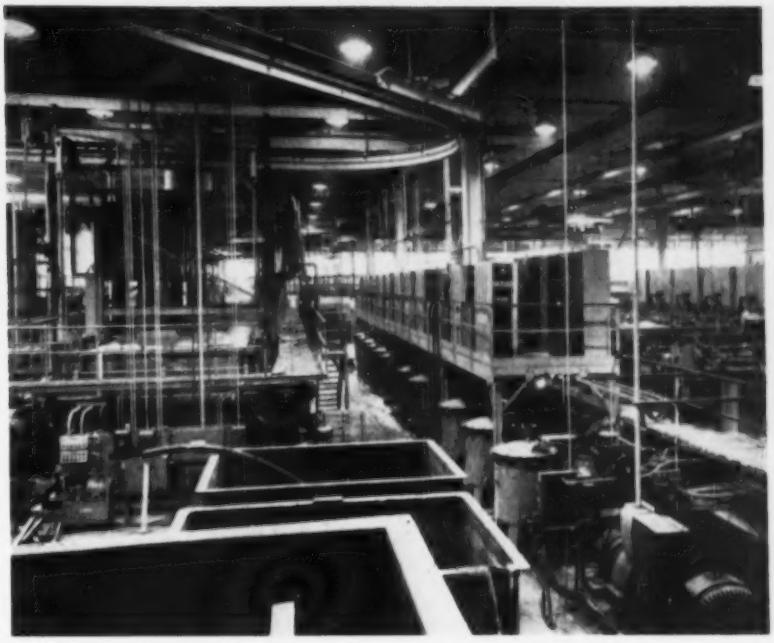
Partially cured pipe has its casting removed. Note m-g set in foreground

A cracked section of concrete pipe is as useless as an odd sock. That's why the Western Concrete Pipe Co. of Sacramento selected d-c power for the delicate handling of partially cured concrete pipe.

Sections of pipe up to 78 in. in diameter and weighing as much as 13 tons are centrifugally cast, then placed in a steam curing box for four hours. Four-hour-old concrete is not very stout. The casting mold is taken off and the pipe is gingerly returned to the steam box for more curing.

Capacity of the casting machine is 30 units per day, so the loss of a single unit would be serious. D-c power for the crane controls is obtained by a motor-generator set in this installation.

D-C Amps 160,000 of Them



Germanium rectifiers and associated induction regulators are located on the catwalk in the center. Plating line is left, with motor-generator sets right front

Rheem Automotive Co. has installed 30 germanium rectifiers producing 160,000 amp of direct current in its Fullerton, Calif., plant. They are used to help power the new plant's semiautomatic bumper plating line. It is probably the largest installation of germanium rectifiers in the plating industry.

Rheem, faced with expanding its plating line, decided to meet its increased d-c power requirements by using rectifiers. They combined 30 new rectifiers with 10 company-owned motor generators to serve as d-c power sources for the plating line. Each of the rectifiers is housed in a 5,000-amp cubicle while the motor generators vary from 3,000 amp to 10,000 amp at 12 v.

The germanium rectifiers' economical provision of d-c power impressed Rheem. They have a lower first cost than rotating equipment and are competitive with other rectifiers. Other economy factors include:

Lower installation costs — Arranged in 5,000-amp cubicles, they are more compact. Thus most of the rectifiers were placed on light catwalks almost directly over the nickel plating tanks in lieu of a larger, floor-mounted motor-generator installation. This makes more floor space available and also permitted savings in cost of electrical equipment. Since the rectifiers could be installed so close to the plating tanks, 500-mil cable was utilized for bus rather than expensive copper bar. The cable is easier to install as it can be bent en route without the splicing that is required for flat copper bar.

Lower operating costs — Rheem expects reduced maintenance costs by use of germanium rectifiers. They have a long operating life. Tests conducted on germanium cells over the past few years reveal no deterioration with age. Other metallic rectifiers are subject to a forward aging trend with extended use.

With the exception of the pump and fan motors, germanium rectifiers do not embody any rotation mechanisms. Also, unlike motor generators, there is no rotating friction or windage losses when plating tanks are not in operation. In addition, their compactness (21 in. wide by 6 ft long by 6 ft high per 5,000-amp cubicle) and light weight (less than 3,000 lb per cubicle) enables a building-block arrangement designed for operating flexibility and ease of maintenance.

Central Control

Four processing lines required for the plating operation cover an area approximately the size of a football field. The entire process is essentially controlled from a master control panel through a complex electrical relay and interlock system.

Ten to 16 bumpers are placed on plating racks and mounted on work carriers. The racks are then automatically delivered to the plating tanks by an overhead monorail system. The bumpers are conveyed through an automatic cleansing and rinsing cycle. Two cleaning tanks in this cycle employ a germanium-rectifier unit for a power source. One 5,000-amp unit is used with a reverse plating cleaning tank and a three-cubicle 15,000-amp unit is used with a sulphuric acid cleaning tank.

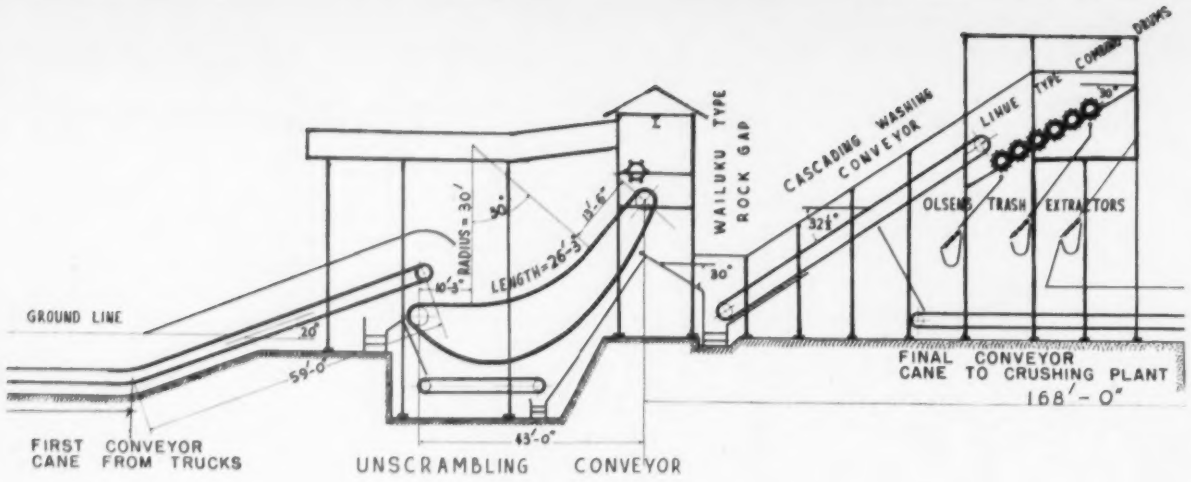
The cleansing and rinsing cycle is followed by a copper strike. Then the bumpers are brought to the nickel plating lines, consisting of 24 tanks. Eighteen of the tanks are each powered by a 5,000 amp, 18-v germanium rectifier.

20,000 Amp Per Tank

Following nickel plating the bumpers are forwarded to the chromium plating line, then conveyed by a manually operated monorail system through a series of 10 cleansing, rinsing and chromium plating tanks. Each tank is powered by a 20,000-amp, 15-v germanium rectifier.

After chromium plating, the racks are automatically picked up and delivered to an unloading area where the plated bumpers are removed for inspection and palletizing.

Rheem's germanium rectifiers are powered from conveniently located secondary voltage bus duct. Primary voltage is 12 kv and is distributed throughout the plant from 12 unit load centers. A simple radial system is used for the 480-v secondary. This secondary voltage is fed into an induction regulator. The output of the induction regulator is fed to the primary rectifier transformer, which reduces voltage from 480 to 26. The secondary transformer is in series with the rectifier and bus to plating tanks. Efficiency of the rectifiers is 86% and the power factor is about 88 at 5,000 amp.



D-C Drive for a Sugar Cane Cleaning Plant

Charles H. McAllister
Power Sales Engineer
Hawaiian Electric Co. Ltd.

and

Frank R. Wiley
Factory Superintendent
Ewa Plantation Co.

Sugar cane delivered to Hawaiian sugar mills contains much foreign material such as rocks, dirt and leaves or trash, which has been gathered up with the cane stalks in the fields by the mechanical harvesting equipment. Extensive preparation is required at the mill to remove this foreign material before the cane stalks can be fed into the crushing rolls.

The cane trucked to the mill is in tangled masses or bundles with rocks, dirt and trash intermixed with the cane stalks and the problem of removing the foreign materials can best be solved by spreading the cane into a thin blanket on a system of various conveyors respectively designed to allow gravity separation of rocks, dirt removal by washing and trash separation by extracting elements.

Considerable speed variation and coordination are definite requirements for an efficient cane cleaning plant. For this reason Ewa Plantation Co., located at Ewa, Oahu, selected a Ward-Leonard-type variable-voltage 230-v d-c system for the operation of the four main conveyors in its cane cleaning plant.

The first conveyor receives the cane with foreign materials from the truck unloading station and delivers it onto the unscrambling conveyor. The first conveyor is driven by a variable-speed 30-hp d-c gear motor.

The unscrambling conveyor is built in the form of a catenary. The cane bundles are tumbled as they travel up the steep slope and are broken up so the cane forms a thin blanket. Many of the larger rocks become separated and roll backward to the horizontal section of the conveyor, at which time the operator reverses the conveyor a few feet to allow the rocks to roll off the lower end. A thin blanket of cane, with smaller rocks, dirt and trash, is discharged over the upper end of the conveyor and falls into the Rock Gap, where rocks and gravel sink to the bottom but the cane floats across the gap onto the cascade washing conveyor. The unscrambling conveyor is driven by a 60-hp reversible d-c gear motor.

The cane is washed on the cascade washing conveyor by sprays and water cascading down against the cane. A 30-hp variable-speed d-c gear motor is the drive for this unit.

From the washing conveyor the cane is discharged over combing drums that distribute the cane among three sets of trash extractors. These trash extractors consist of rotating elements closely meshed together and they strip the leaves or trash from the stalks, allowing the clean cane to fall on the final conveyor, which delivers the cane to the crushing plant. The final conveyor is driven by a 15-hp variable-speed d-c gear motor.

The d-c for these drives is furnished by a five-unit m-g set consisting of a 200-hp, 440-v induction motor, a common exciter for all the d-c motors and generators, and three differentially compounded d-c generators. No. 1 generator furnishes power for the first conveyor, No. 2 generator furnishes power to the unscrambling conveyor and No. 3 generator serves both the cascade conveyor and final conveyor that are operated together.

A single control station allows one operator to control all the d-c drives in addition to the auxiliary motors used for the cross conveyors, which remove the rocks, dirt and trash that are separated from the cane.

After several years of successful operation, Ewa Plantation feels that the application of d-c drive to the four main conveyors in its cane cleaning plant not only affords the flexibility of operation inherent with variable voltage d-c control, but also has greatly reduced the probability of chain breakage and gear damage because of the gradual application of torque not possible with conventional a-c drives.

The Ewa sugar cane cleaning factory

Electric Elephant

An electric log stacker, nicknamed the "electric elephant," is stacking logs at Weyerhaeuser Timber Co.'s pulp mill faster, more safely and more efficiently than previously was possible. It lifts an entire load of 6 to 50 logs at one time from a log truck, backs away from the truck, rolls to the small mountain of logs already stacked and deposits its burden. It then returns to the truck, raises the truck's trailer into the air and sets it in place behind the cab where it will ride on the truck's return trip to the woods for another load.

Within about five minutes from the time it first started the operation, the log stacker is ready for the next load of logs.

Previously, the logs generally were piled one or two at a time by a boom crane or donkey-run pulley system.

The electric elephant weighs approximately 27 tons and has a lifting capacity of 25 tons. A 300-hp Cummins diesel generates power for two generators, one a-c and one d-c, which supply power to eight electric motors. Each of the four wheels has its own d-c motor while the fork lift, steering mechanism, tusks and tilt-drive each has its own a-c motor. Motors and generators are made by R. G. Letourneau Inc., Longview, Texas.

The business end of the log stacker is an ingenious elephant-like arrangement. Its tusks are three heavy prongs that go under the logs to be hoisted. A pair of curved prongs moves forward and down to wrap around the load from the top, much as an elephant's trunk does, to keep the logs from rolling off the forks. Still another pair of prongs serves to push the logs from the carrying forks when the load is set in place.

The 33-ft boom on which this assembly rides up and down can be tilted forward, making it easier to stack the logs on top of the pile.

Electric elephant loaded with timber

Meet Roy Crowder

Roy Crowder has been a welder for 25 years—the last 15 for the Diamond Match Co. Somehow in the production of 90,000,000 fbm of finished lumber, part of most everything in the plant will break. Roy and his welder fix them. Recently Roy came by a d-c rectifier welder and had the following comments.

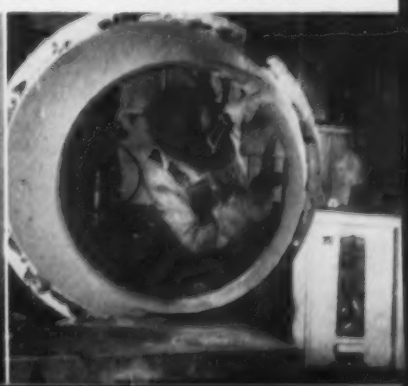
"I have welded with just about every kind of machine there is but I can truthfully say this is the best machine I have ever seen. If anyone wants to know about a d-c welder, send them around and I'll tell them. It can weld *anything* – aluminum, cast iron, stainless steel, sheet metal, heavy jobs, anything! You can even use bronze and braize with it.

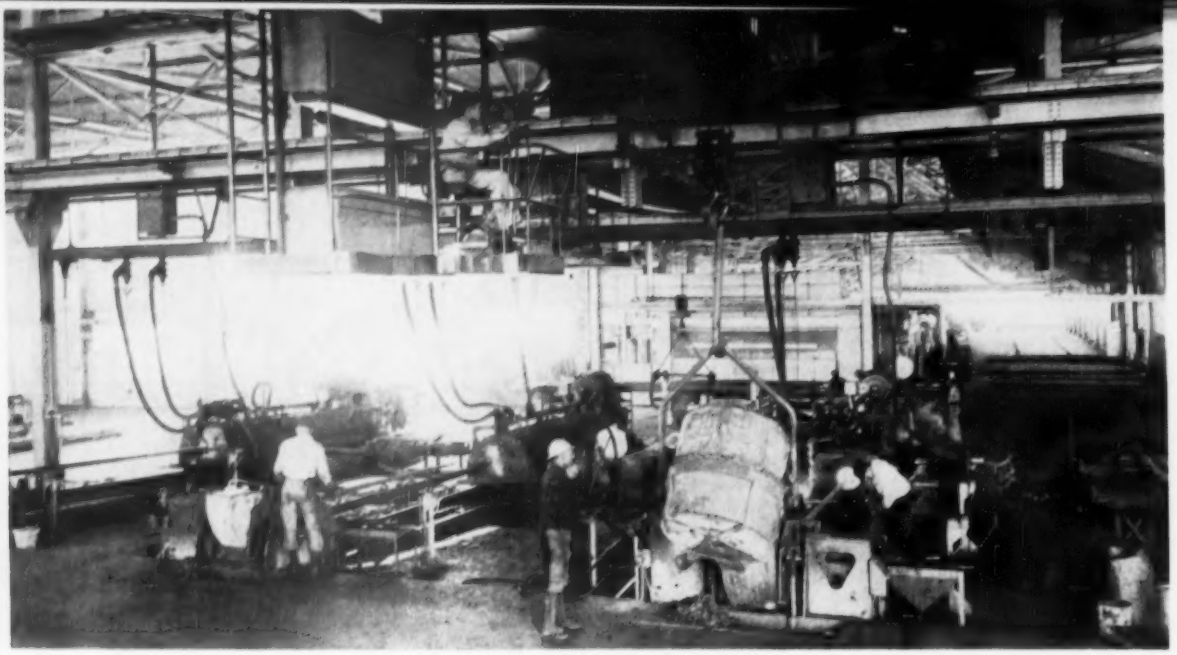
"With an a-c machine, you've got to pick your material, but with this machine it doesn't make any difference, you just weld anything."

Roy interrupted a repair job on a big fork-lift truck to go inside to the welding machine, saying: "Here's what I like about this machine. It has fast, easy control. When you set the amperage on this machine, you know you've got it. It doesn't surge up and down like others do. They get cool and you have to wind 'em up—then it's getting hot and you are liable to burn up your metal."

Certainly a-c welding equipments have their place but, where there's a wide variety of materials and welding conditions, most welders lean toward d-c. When the plant is down because of broken machinery, taking time to send it out for repairs might hold up the whole mill. That's when Roy Crowder and his d-c welder really earn their keep.

Roy Crowder, doing the rounds, repairing a lift truck, right, setting welder, center, welding an aluminum housing, right





The casting machine, left, is the heart of the process. The large piggyback-mounted d-c motor enables operator to change speeds for each size and thickness of pipe. D-c motors, right, rotate the pipes for cement lining process

D-C Powers a Pipe Plant

Paul Arnold is a shirtsleeves sort of a boss. He set his tin hat and safety glasses down on his desk and leaned back in the chair. "Sure, I'll tell you about the cast iron pipe business. Use of cast iron goes back as far as the middle ages. The Dillenburg Castle in Germany had a cast iron system. The famed garden fountains at Versailles, built in 1664 used a cast iron supply line—it still works, too. Present-day use of cast iron pipe is pretty much the same, water sewage and gas, and a few special industrial applications. We are darn happy to be in this business and particularly glad to be located in the West, serving growing communities that have ever-increasing needs for our products."

He turned to Al Montgomery, production superintendent, and smiled. "Al, if you put all the pipe you and I have made end to end it would probably go to where we're going and back again."

Feet down, hat and glasses on, "come on and let me show you the plant. We have d-c power and plenty of it. It starts the minute we use the d-c powered magnetic crane to unload the pig iron and scrap that are raw materials. Once the charge is placed in the cupola, this recipe for pipe is ready for the furnace. D-c control equipment controls the pouring of the molten iron and the large piggy back motor on the centrifugal casting machine spins the casting, shaping it, while the water jacket cools and sets the casting."

Gordon Tinsley, the master mechanic, had joined us and added: "This is the critical process. The spin speed has to be changed to ac-

Looking at the main bay where d-c equipment helps in lifting and handling, casting. Six kw of d-c power per employee

commodate diameter and thickness of the pipe. This spinning program is handled by the d-c motor and associated automatic controls. From here the pipe is picked up (by d-c controlled cranes) and processed through a heat-treating furnace. From this point the pipe is tested and cement lined."

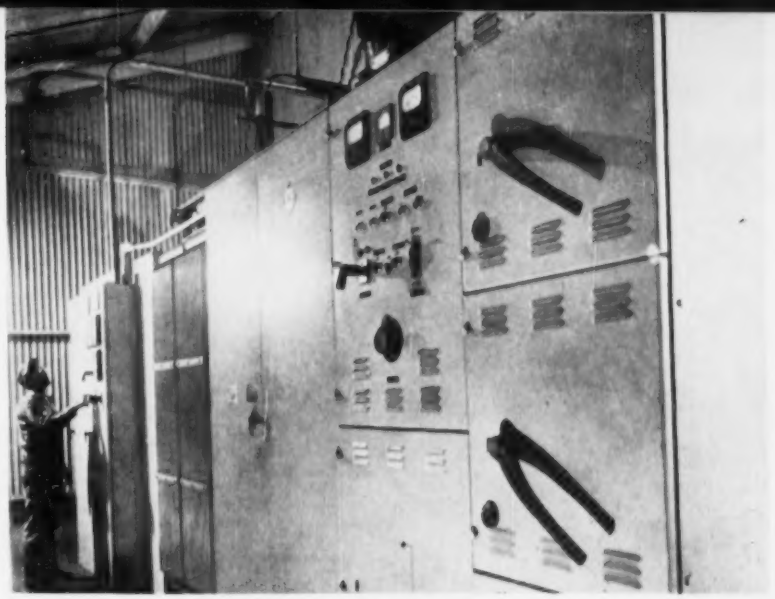
Al Montgomery added, "Watch the way in which the speed increases after the mortar is applied to the inside of the pipe—more d-c. Curing, sealing and coating, and that's it," said Al.

"Not quite all," added Gordon. "Come on and take a look at our rectifier substation. It is a package equipment, rated 500 kw. This sealed tube rectifier equipment converts the 4,160-v a-c power to direct current. On the d-c side, there is a main breaker and three distribution sections. It's good equipment, a trouble-free source of power for the past five years."

Paul Arnold came forth with, "well, that's our pride and joy. Now you are probably wondering why our processes use so much direct current. There are a variety of reasons. Some jobs of course can only be done with direct current and we have no choice. In other areas, we feel that the safety and reliability inherent in d-c equipment, particularly in such areas as handling the molten iron, makes the d-c equipment a necessity. In still other areas, we considered other kinds of machinery. In many of these areas d-c equipment has proved out economically.

"All in all, the d-c equipment gives us a production setup, puts out —is this for publication—a heck of a lot of pipe."

Pig iron is handled by magnetic crane



A 500-kw sealed tube rectifier provides the majority of d-c power for the plant

D-C Drives A Processed Paper Plant

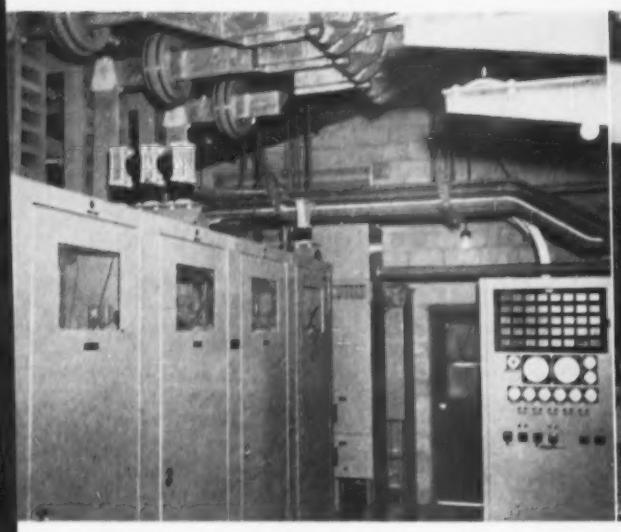
The ability to precisely control the speed of d-c motors has brought them into common usage in the metals industry. A similar and yet perhaps more critical application is at the American Sisalkraft Corp. plant in Tracy, Calif. Here, d-c motors provide the precise control for the manufacture of specially reinforced papers for the construction and packaging industry. The d-c powered "line" starts with kraft paper and successively laminates, treats for mold, adds moisture protection and reinforces, creating a rugged product impervious to the elements.

The control scheme maintains constant tension on the paper as the paper rolls vary in diameter. This control maintains the proper speed relationship between the various rolls during processing.

D-c power is supplied from two motor-generator sets for the line drive motors. Small d-c requirements elsewhere in the plant are obtained from packaged rectifier equipments located near the motor to provide good regulation.

This particular use of d-c motors is an extension of one of the oldest applications. With a considerable increase in the continuous process industrial plant, it seems reasonable that we can expect an increase in the use of d-c drives.

A general view of the coating line. Beta gage equipment controls paper thickness



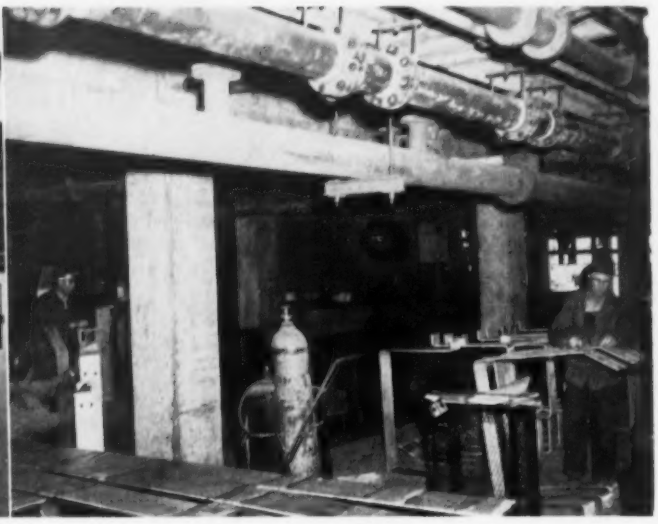


Photo at left shows the rectifier cubicles, overhead, d-c bus with d-c CTs and operator's control panels. Photo, right, shows basement of electrolytic cell building showing preparation of aluminum bus prior to protective coating

Dow Chooses Germanium

Wendell R. Kiltz
Electrical Engineer
Dow Chemical Co.

The electrolysis of brine yields hydrogen, chlorine and caustic soda. These three chemicals resulting from a single process find their way into nearly every chemical process. End products are ammonias, bleaches, chlorinated hydrocarbons, such as askerels, soaps, rubber, gasoline production—the list is endless. The basic nature of these products causes their markets to be extremely competitive and producers have to watch their costs and efficiencies in order to be competitive.

D-c electricity being a sizable portion of the raw material cost has caused Dow Chemical Co. to study and select germanium rectifier equipments rated 30,000 amp at 150 units for their Pittsburg, Calif., facility. The installation, nearing completion, will be the largest of its type in service on the West Coast. The plant takes 22,000-volt, a-c primary power and supplies 150-volt, d-c current to the cells. The basic optimum rectifier unit is 15,000 amp at 75 volts d-c, two sections of which are connected in series to obtain the 150-volt level.

Efficiency High

Germanium power rectifiers were chosen over other available means of rectification because they presented the following advantages: high efficiency (95% guaranteed including transformer), high power factor, good stability, small factory space requirement, and low maintenance cost.

Because the business end of the rectifier is a small germanium wafer about the size of a dime even the small losses require special attention. The condition is somewhat aggravated by the low inherent thermal capacity of the germanium wafer which requires high-speed fuse protective systems to prevent damage to the equipment. The losses from the cells are removed in this installation by a closed system coolant which uses perchlorethylene for the coolant. As a coincidence perchlorethylene is an end product produced by Dow in Pittsburg and made from the basics which result from this process.

Aluminum Bus

This installation incorporates another "first" at Pittsburg. Although Dow's other plants have successfully used aluminum bus bars in such highly corrosive locations, the Pittsburg plant is using aluminum for the first time. Approximately 15 tons of aluminum bar is being installed—all requiring special handling and preparation. Bus bar joints are always a source of trouble, so special care is being taken in their preparation. All bolted joints are being made with high strength alloy steel bolts and two Belleville spring washers each. The Belleville washers are not flattened completely, but approximately one-third of their dish is left for joint expansion. The joints are designed for a minimum of 200-psi pressure. Before assembling the joints, all bars are cleaned and thoroughly buffed with Alcoa No. 2EC joint compound. In areas of high ambient temperatures exceeding 110 deg C, Unoba No. 2 compound is used instead of Alcoa No. 2EC. Where the bus bars are subject to alkali spills, they are protected with suitable barriers or else copper bars are substituted for the aluminum bars. Where copper bars are bolted or clamped to aluminum bars, the copper bars are first silver plated to minimize electrolytic corrosion at the joints.

On The Line Soon

While these equipments will not be in use for another few weeks there is the feeling that the electrical system will contribute materially to the economy of the process.

Expensive Shutdowns Can Be Prevented

C. W. Doane
Larsen-Hogue Electric Co.
Los Angeles, Calif.

With the ever-increasing automation of processes in industry, direct-current motors and generators are being used more and more frequently. D-c motors provide the wide speed variations in fine accurately controlled increments that are so necessary to automated operations. Furthermore, in recent years small compact unit sources of d-c power have become available in the form of rectifying tubes and plate-type rectifiers. This increased use of d-c power multiplies the problems of maintenance on d-c rotating machinery and industrial plants are today faced with a substantial problem of keeping their automated processes free from interruption because of failure of equipment.

There are varying schools of thought regarding the extent to which preventive maintenance should be undertaken on the spot sources of d-c power, such as the various types of rectifier units. Many industrial plants where interruption of production is extremely costly keep on hand complete spare rectifier units. Other plants where reasonably short periods of down time can be tolerated and where there is an electronic technician on the pay roll just stock a few spare parts such as tubes and resistors. In the latter case, the skill of the electronic technician must be relied upon to locate and replace the defective part quickly.

By way of preventive maintenance on rectifiers and magnetic amplifiers as d-c power source units, periodic inspections of wiring connections and leads to see that connections are tight and leads are free and clear and well insulated to prevent shorts and grounds will pay off in forewarning of future trouble. Tube testers can be used periodically to ascertain the most expedient time for replacement before failure.

In general, however, the rotating d-c apparatus of motors and generators requires more preventive maintenance and it is with this type of equipment that this article will be concerned primarily.

One of the prime considerations in maintaining all types of electrical equipment properly is to keep it clean and dry. This is particularly true of d-c motors and generators with their commutators, brushes and brush rigging.

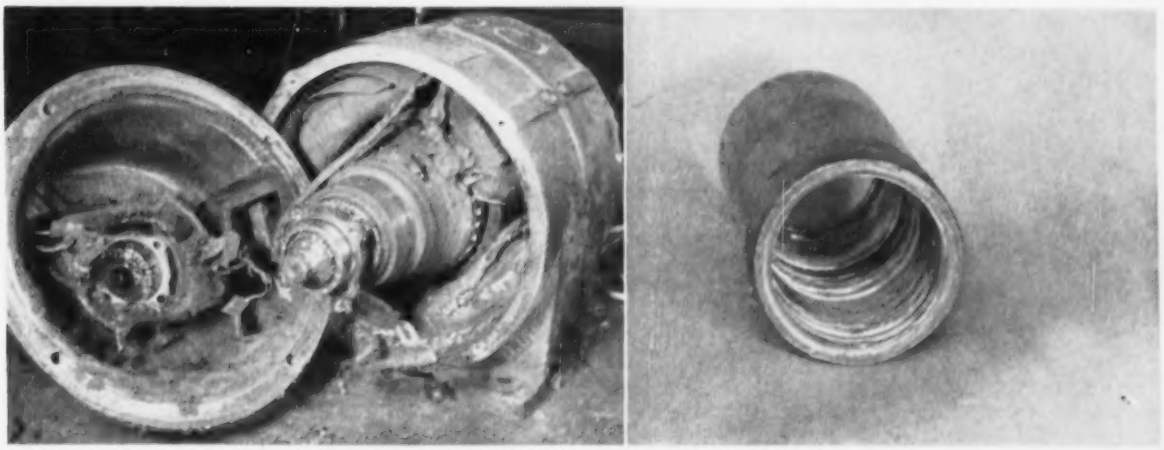
It is essential to take suitable precautions to protect the equipment from the effects of oil, dust, grease, moisture and corrosive gases. Commutators and brushes cannot give good performances when exposed to adverse conditions. It cannot be overly emphasized that oil and grease are particularly damaging to commutators. Reference to an accompanying photograph clearly illustrates a flagrant example of complete neglect in keeping a d-c motor free from the damaging effects of dirt. This motor had apparently never been inspected or cleaned since its original installation and the resulting repairs included rewinding both armature and fields.

Periodic inspection of equipment is the best way to anticipate and prevent interruption of production due to failure of equipment. Frequent inspection should include bearings, brushes, brush rigging, brush spring tension, commutator surface, armature bands, armature and field windings and connections, and field rheostats.

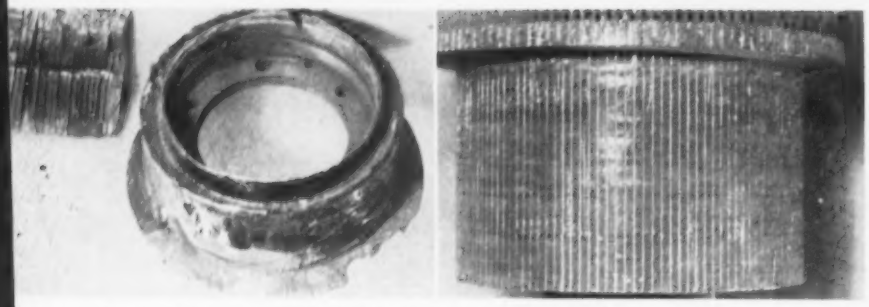
Bearings

Sleeve bearings can be frequently inspected for temperature and occasionally the motor air-gap can be measured to detect excessive bearing wear. A sleeve bearing which is running abnormally hot can be due to many causes, among which are:

1. Insufficient oil
2. Failure of the oil rings to revolve with the shaft
3. A poor grade of oil or dirty oil
4. Excessive belt tension
5. Rough bearing surface
6. Improper fit of the bearing housings
7. A bent shaft
8. Misalignment of shaft and bearing
9. End thrust due to improper leveling or due to magnetic pull



The above photographs highlight the need for maintenance to prevent damage from accumulated dirt or oil shortage



Left, effects of poorly fitted brushes; right, oil and dirt on commutator bars

When a bearing is found to be operating at an abnormal temperature, then it is the time immediately to determine the cause and correct it before expensive damage is done to the equipment.

Most of the causes of excessive heat in sleeve bearings also cause ball bearings to overheat and fail. Overlubrication, especially of ball bearings, is, at least from our experience, the most prevalent. Excessive lubrication produces additional friction and consequent temperature rise of the bearings during operation. Overlubrication of the bearings also results in the motor or generator windings becoming saturated with grease and oil, which deteriorates and shortens the life of the electrical insulation, eventually causing a burn-out. An accompanying illustration forcefully shows the damage caused by the improper amount of lubrication. In the case of the sleeve bearing shown, the oil level was allowed to drop below the point where the oil ring would pick it up.

Commutator Maintenance

One of the most important considerations in the preventive maintenance of d-c motors and generators is with respect to the commutator. It is imperative for good operation that the surface of the commutator be kept smooth, clean, concentric and properly undercut.

If poor commutation is evidenced by excessive sparking, burning or heating it may be due to one or more of the following causes:

1. **Incorrect brush position**—For most satisfactory operation, good commutation and freedom from commutator troubles it is imperative to keep the brushes set on the neutral position and to keep the brushes equally spaced around the commutator. Usually the neutral setting position is marked on the machine by the manufacturer at the factory. If these markings are omitted or illegible there are several methods of locating the neutral brush position and most electrical maintenance handbooks will discuss these methods in detail.

2. **Poorly fitted or worn-out brushes**—The correction of this condition is obvious. One of the photographs shows a commutator burned and pitted because of poorly fitted brushes.

3. **Incorrect grade of brush being used**—Frequently replacement brushes are installed with thought given only to the proper dimensional size and with disregard for the physical composition of the brush. It is also essential that brushes of the correct grade be used when replacing.

4. **Rough commutator**—Commutator roughness is usually characterized by an abrupt change from one bar to the next as distinguished from an eccentric commutator in which there is a very gradual change in the surface where the commutator is out of round. A variation of as little as one thousandth of an inch is often sufficient to cause a commutator to perform badly, break brushes or cause excessive brush wear on high-speed commutators. When such conditions as these are found the condition should be remedied immediately.

5. **Short circuit in the armature**—If a short circuit in the armature exists it should obviously be located and repaired or the armature rewound.

6. **Too light a load on the equipment**—Brushes of certain composition are designed to operate within definite temperature ranges and if the equipment is very lightly loaded the brushes will give poor commutation bcause they are too cool. This condition can be remedied by removing some of the brushes until good commutation results.

7. **Brushes tight in the holders**—Any brushes found sticking can be freed by sanding the high spots with fine sandpaper.

8. **Brush spring tension incorrect**—The proper brush pressure recommended in most instances is as follows:

Soft graphite, 1¼ to 2 psi of surface
Carbon and carbon graphite, 1¾ to 2½ psi of surface
Electro graphite, 2 to 3 psi of surface
Firmly bonded graphite, 3 to 4 psi of surface

Brush pressure can be easily measured with a scale.

9. **High mica on the commutator**—The obvious remedy for this condition is undercutting of the commutator.

10. **Acid and chemical fumes**—It should be obvious that acid and chemical fumes should be kept away from commutators. Certain acid fumes will attack and destroy the commutator copper and other chemical vapors will destroy the copper oxide film on the surface of the commutator which is required for good commutation.

11. **Brushes not having been seated properly**—When brushes are not seated correctly the area of contact is reduced and the current density at the surface which is in contact with the commutator is excessive causing heating, sparking and burning. This can be remedied by seating the brushes with fine sandpaper. Emery cloth should never be used for this purpose.

12. **Dirt, especially oil**—As previously mentioned, oil and grease are extremely damaging to commutators because the resultant burning of these lubricants starts a progressive chain of carbonization which causes more burning and shorting of the commutator bars. A photograph illustrates the extreme damage that dirt and oil can cause to a commutator. The mica V-ring commutator bars have been disassembled and photographed to show the damage done by the severe burning of dirt, oil and carbon that had collected around the commutators.

It has been the intent in this article to stress the need for exercising preventive maintenance in connection with important d-c equipment and briefly to point out a few of the necessary considerations in such a preventive maintenance program. The experience of those in the industrial electrical repair field clearly points out that interruption of production is more often caused by failure of the human element to do its preventive work rather than by inherent defects in the electrical apparatus.

D-C Is for Contractors With Know-How

Electronic exciter tube in packaged 10-hp motor, 5-hp generator set that operates variable voltage drive with speed range from 150 to 1,100 rpm in a foil plant in Berkeley pointed out by S. N. Feldman. It was built into a panel board

"You can't be just a two-wire electrician in handling modern direct current for industry," says S. N. Feldman, engineer and proprietor of Electric Construction & Engineering Co. in Berkeley. For this industrial issue, featuring modern direct-current applications, he was asked, because of his experience in industrial electronics and special applications, "is there anything different or unusual in wiring for d-c?"

Feldman went on to explain that for modern d-c applications the electrical contractor must not only take into consideration the d-c application but the source of supply for the direct current through some type of a-c to d-c conversion equipment. In the early days of the electrical industry, direct current used to be distributed by the power utilities throughout the commercial and industrial districts. This is no longer true. The uses of direct current must now provide the means to convert alternating current for it. Hence the wiring installation is a combination to provide energy and control for the a-c side, as well as the d-c side of the system.

Such a contractor should be familiar with the various types of conversion equipment. The most general is a motor-generator set but today there are very efficient vacuum tube rectifiers as well as plate-type metallic rectifiers. Each has a particular scope of characteristics which a contractor should know and wire for accordingly.

While the same conduit and wire sizes, as covered in the National Electrical Code, prevail for both a-c and d-c, it is well to bear in mind the greater voltage drop in d-c conductors. Ample capacity must be provided to compensate for the length of the conductor run. As a rule, such conductors are kept at a minimum length by locating the conversion unit as close to the load as practicable.

More care is necessary in selection of circuit breaker protection and for control equipment. The characteristics of direct-current arcs on the breaking of a circuit are such that they are drawn out to a greater length. Hence the quenching of that arc must be accomplished with equipment capable of doing so.

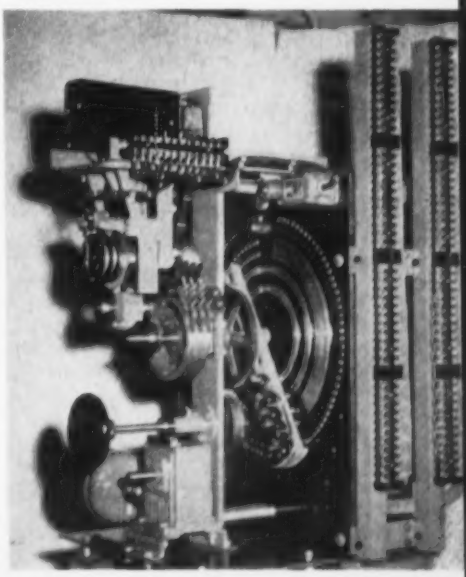
The contractor has first to consider the a-c supply with its control and circuit protection, installed according to the code, and good engineering practice.

Second and more important are the circuits and the control equipment from the conversion unit to the work to be performed by d-c.

The greatest use of modern d-c is for infinite variable speed control of motor drives. Although there have been great improvements of speed control in a-c motors, d-c still gives the most accurate and finite speed regulation. This becomes more important in automatic processes in industry.

After conversion, say from three-phase a-c to 240 or 480 v at relatively low amperage, the d-c achieved from the conversion is usually at a lower voltage and a much higher amperage. For speed control, rheostats are the most generally used. However, other devices such as drum controllers and numerous other control components, some of them electronic, also have their special applications.

Another major use of direct current is in some form of electrolytic processing where, again, high amperages at low voltages are employed. The equipment and the conductors must be calculated for such operating conditions. The contractor can not just figure putting in his ordinary two- or three-wire connections such as he does on an a-c motor and standard controller. Modern d-c con-



Remote operation of the d-c rheostats that control speed for a 125-hp d-c motor in a range from 50 to 1,200 rpm was provided by Feldman Electric in this control mechanism engineered and designed by it for a dredge. From 200-ft distance, operator operates rheostats by means of a-c servomechanism

version equipment is supplied in packaged units, which only require connections at either side, but the application of the d-c needs to be considered by the contractor in calculating his conductor sizes and other equipment.

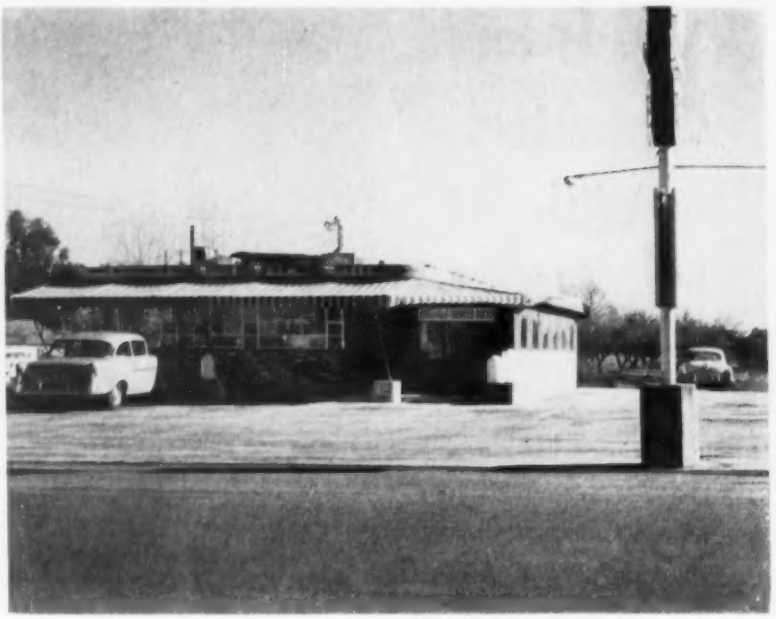
"More d-c is being used in industry these days than for many years," says Feldman. "Many contractors have the impression that d-c has been going out. The power companies have quit supplying d-c from their mains as they did for elevators and the old d-c lighting systems, it is true. All of these have been converted to a-c. Elevators continue to be operated by direct current because of the more infinite possibilities of control. But these are supplied with their own motor-generator sets.

"The electronic tube rectifiers have been coming into use more generally as they have been developed to handle much larger capacities. With them, three-phase a-c can be converted in large capacities. Indeed, the remaining street railway systems or electric railway lines very often are supplied direct current nowadays through vacuum tube rectifier equipment. The tubes are hermetically sealed metal tubes and are practically trouble-free.

"Plate-type rectifiers of the copper oxide and selenium, germanium or silicon type are being used in a great many applications. Where a steady flow of current is required, such as in electrolytic processing, they find a very efficient use. Likewise, where small amounts of d-c are needed to energize coils or magnets the plate type is often used rather than installing motor-generator equipment. If the application is limited to one place, the small packaged plate-type unit takes little space and can be located right at the load."

To summarize, Feldman says that the electrical contractor must know this equipment to estimate its installation correctly and install it right. It requires more labor and a more highly skilled electrician than the ordinary installation. This is particularly true when it is used for variable speed control. The electrician must know what he is doing and know how to trace the circuiting properly and to do a more workmanlike job of making connections.

Among interesting d-c applications that Feldman has engineered and installed are these: a cable hoist at a dirigible mooring mast for the large dirigibles formerly stationed at Moffatt Field; paper plant and steel rolling mill drives, printing press drives.



A view of McConochie's from main street, showing electric-heated patio sign

Dual Duty for Infrared

An electrically heated patio invites customers into an attractive, well lighted and heated dining area at McConochie's Foster Freeze in Carmichael, Calif.

Since it was impractical to use conventional heating in the canvas-covered patio, 20 250-w industrial hard glass infrared lamps were installed on conduit outlet boxes, mounted at approximately 8 ft directly over the benches and 3 ft apart. As a result of this installation, an unusable winter space was turned into a year-round profit-producing area.

Installing electric infrared is only one phase of this customer's conversion to electric equipment. He has recently replaced a griddle and a fry kettle with modern electric cookery.

Mr. McConochie says: "In my business, speed is essential as well as quality control. Another factor involves keeping customers through the winter season. With the use of electricity we have met both problems. By changing to all-electric cooking my customers never have unnecessary delays. The electrically heated patio has helped to keep our family trade and brought many favorable comments. The electric way has definitely been a great asset to my business."

An inside view of McConochie's Foster Freeze infrared heated patio. Note the canvas roof over the lights

First prize winner, Emil J. Weber, San Francisco, Andy Masser, Walnut Creek, second prize winner and Bob Jones, Hayward, third prize winner, receive their awards from Bert Reynolds, Northern California Electrical Bureau manager

Certified Lighting Contest

Pinpoints Outstanding Jobs

Results from the Certified Lighting Contest among electrical contractors, sponsored by the Northern California Electrical Bureau, were so satisfactory that not only will the bureau stage a similar contest again later in the year but the National Certified Lighting Bureau will likewise sponsor a national contest. In the northern California contest, which ran from Sept. 1, 1956, to Jan. 31, 1957, 82 entries from 44 electrical contractors in nine divisions of Pacific Gas and Electric Co. were received. Awards were made on a point basis. Emil J. Weber Co., San Francisco, with 3,791 award points resulting from 10 outstanding jobs, among them the World Trade Center, Continental Casualty Insurance Co. and Dollar Steamship Lines, won the first prize of $175.

Second prize went to Thompson Electric Co., Walnut Creek, with 2,155 award points. One of the entries in the contest by them was their new store, which has an outstanding lighting installation.

Third prize went to Jones Electric Co., Hayward, with 1,300 award points, including an 86-f-c job for Gallenkamps and 122-f-c job for Owl-Rexall.

United Lighting & Ceiling Co., Oakland, with 1,030 award points won fourth prize. Among its entries was a luminous ceiling installation at Donner Scientific Co., Concord.

The divisions ranked as follows in contractors/entries/award points: East Bay Division, 12 contractors, 26 entries, 8,382 points; San Joaquin, 16 contractors, 21 entries, 4,838 points; San Francisco, two contractors, 11 entries, 3,986 points; Sacramento, two contractors, six entries, 1,915 points; North Bay, three contractors, five entries, 1,170 points; Stockton, three contractors, five entries, 1,090 points; Coast Valleys, two contractors, four entries, 1,010 points; Drum, two contractors, two entries, 710 points; Humboldt, two contractors, two entries, 410 points.

The entries represented 42 cities and towns.

Opportunity for more certified lighting jobs should come from the exhibits staged by the Northern California Electrical Bureau and PG and E at the apparel market and the furniture market in San Francisco in January. All visitors to the exhibits in the Sheraton-Palace Hotel and the Merchandise Mart were given a list of certified lighting graduate contractors and a complete list of the visitors has been prepared by divisions for follow-up by certified lighting graduates in their home communities. The exhibits caught the buyers and managers of stores in a receptive mood. They were given a short lecture and demonstration of the various types of show window and interior lighting. Especially stressed was the possibility of using luminous backgrounds in show windows to reduce daylight window reflections. Since packaged units of these backgrounds are now available it is felt the contractors can sell them more advantageously.

Luminous show window background and window lighting set used at two markets

ELECTRICAL WEST

Tight Money

OUR vigorous free-wheeling, free-spending dynamic economy is running out of fuel. The fuel, of course, is the funds necessary to keep it rolling as fast as it would like to go. In the words of the economist, the demand for funds has exceeded the normal rate of capital formation. The danger is that this could be more than a temporary situation.

Capital formation merely represents the thriftiness of the citizens. Despite the fact that savings are at an all-time high, there still is not enough money to meet all of the demands for it. Therefore, the price or rent of money is being bid up to higher interest rates.

The savings of the country take many forms. There are insurance premiums, pension funds, savings banks, home loan companies and the old mattress. Despite the fact that people are still reasonably thrifty, there are tremendous hurdles that block the way toward the accumulation of funds which will be needed to finance the rosy future predicted by the experts. The first of these is the income tax which penalizes persons and businesses alike, taking from the former more than half of its earnings and from the latter everything from 20% up to 90%. This high income tax, in turn, reflects excessive government spending through waste, inefficiency, political log-rolling, pork-barreling and personal empire-building.

The second great obstacle to savings is the fear of inflation. Inflation is the dishonest hidden tax by which governments cheat their citizens out of all or part of their savings. Inflation occurs when the government either prints money directly or spends beyond its income. It has a particularly devastating effect when the government spending puts government agencies into business in competition with the citizens. Then it reduces their ability to save as well as increasing the tax load they must bear. So long as the threat of inflation exists, there is little incentive to save because a dollar saved today may be worth only a dime 10 years from now.

Viewing the future capital needs of the country, it is disheartening to note that so little is being done to encourage thrift. There is no discernible effort being made in Congress to overhaul the tax structure of the country. The politicians are merely giving lip service to economy in government. There is every evidence that the new Congress is inflation minded. Under these circumstances, priming the fuel pump for the economic machine may be difficult.

Every citizen has a primary interest in preserving a favorable economic climate for future growth. Every opportunity to encourage governmental thrift and honesty at every level should be exploited to the fullest extent. Without vigilant supervision and vocal criticism of all legislation that saps the pools of savings, it is possible that the present tight-money situation could expand into a national calamity.

Starting Point

"AIM HIGH" may be a good motto for almost everything, with the possible exception of procuring enough engineering graduates to meet the future requirements of the technological age. Once a student enters college, the die has been cast. The stimulation of interest in an engineering career must be initiated while the teen-agers are in the midyears of their high school education.

A step in this direction is a new club that has been formed at the Burlingame (Calif.) High School which can now boast of having one of the few engineering societies at the high school level.

Membership for the club is drawn from students in the mathematics, science, chemistry and mechanical drawing courses. Such an organization not only can help orient its members toward the various fields of engineering and attract other interested students into its orbit but it also undoubtedly will tend to reduce the high mortality rate of good prospective engineers who are lured into

EDITORIAL VIEWS

other careers for the lack of guidance, challenging discussions and general interest on the part of practicing engineers.

The faculty and students at Burlingame High School are to be congratulated on creating their engineering society. It is hoped that more high schools will follow suit. The real value of such organizations, however, lies in the hands of professional engineers without whose interest and support they cannot flourish.

Such clubs or societies provide at least one way for the professional engineer to contact prospective engineering students at the time their career decisions are being made. All who have expressed concern over the future engineering manpower requirements should be willing to take the time and effort necessary to insure that high school engineering society programs are thought-provoking and meaningful by assistance and participation. But even before that can happen, the groundwork must be laid. Is there an engineering society in the high school of your local community? If not, there is an opportunity to do something about the engineering manpower shortage at the time and place where it will count most.

Insurance for Tomorrow

EVERYONE will agree that research has become an indispensable part of the dynamic economy of the country. The cost of research is the insurance premium that must be paid for survival whether that survival is being discussed in terms of the nation, the business organization or the individual.

Unfortunately weapons research must continue to insure national survival. Medical research is the handmaiden of individual survival. Industrial research is increasingly necessary in this highly competitive era of pyramiding technological development if a business is to survive. Happily all this research has the by-product of an immeasurably higher living standard for the country.

Dollarwise, the costs of research are skyrocketing. It is startling to learn that this nation in the past five years has spent as many dollars for research and development as in all of its previous history. The annual $5 billion price tag on its research and development expenditures is about 25 times the amount that was spent annually 20 years ago. In that same period, however, these research expenditures have produced a number of brand new industries, millions of jobs, and account for nearly half of the products that have become commonplace adjuncts to better living.

Actually, the price is relatively low. Economists who have studied the problem state that the average U. S. business spends about 1% of its sales for research but they suggest that a 5% expenditure probably is more nearly in order if a modern business expects to keep up with competition in the future. It is increasingly apparent that every company, large or small, must be monitoring its markets, its products and its productive procedures continuously. Maybe 5% of the sales cost isn't too much to pay for the research that will insure being around tomorrow to enjoy its benefits.

THIS committee concludes that proposed power generation facilities must be constructed with all possible speed and urgency to meet the rapidly growing demands . . . by whatever group or governmental unit that is prepared to proceed immediately. . . . All sources of capital will be needed. Our studies indicate that hydroelectric power is cheap power by whomever constructed. . . . Regulatory bodies of the state and federal governments are adequate protection to consumers.— Report of the Hydro-Electric Committee, Columbia Empire Industries, Inc., Portland, Ore.

At the general session: O. R. Doerr; Walter Maytham, PCEA president; J. R. Hartman, Electrical Ind. Coordinating Com.; Section Chairman Aiken

Helen Kirtland, LBE consultant, with Mary J. Kelly, home economics chairman

PCEA Business Development Section Stresses

Industry Interdependence

With a registration of 320 and a program suited to the varied interests of its members, the Pacific Coast Electrical Assn. Business Development Section held a highly successful conference Feb. 28-March 1 at the Sheraton-Palace Hotel in San Francisco. Presiding at the general sessions were D. S. Aiken, Pacific Gas and Electric Co., chairman, and J. Clark Chamberlain, San Diego Bureau of Home Appliances, vice-chairman of the section.

A one-hour general session on Thursday was followed by parallel meetings at which the section's nine committees considered the particular interests of their members. The group met as a whole again at Thursday lunch and at Friday breakfast and lunch.

Brief reports follow:

General Session

As we go into the atomic age, with use of electricity increasing 300 to 400%, we will have to inject into our business atomic salesmanship to pave the way, O. R. Doerr, vice-president in charge of sales, Pacific Gas and Electric Co., said in welcoming the group. The customer is going to need intensive education before he can make maximum use of between 400 and 500 applications, he continued. We have the makings of that kind of dynamic sales program in our present national promotions, he pointed out, but there is room for many more big ideas that will motivate customers to use our products to a greater extent.

Why Is Salesmanship Important?

With gross national product highest in history and scheduled to go higher, why is salesmanship so important? asked Walter J. Maytham, Westinghouse vice-president and PCEA president. It is important because industry today is facing a higher and higher break-even point and because straws in the wind suggest that possibly this prosperity is not so firm as we would like to believe. Sales will keep prosperity going, he stated, and an honest look will help find a way. National industry programs all help us sell this product of ours, but we ourselves will have to do the selling, he reminded.

Success Depends on Local Effort

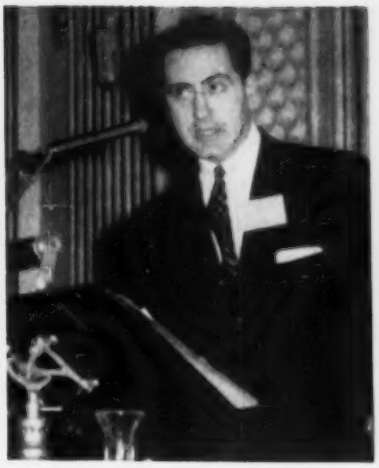
Phenomenal strides have been made by the electric industry in coordination at the national level but continuation and expansion of such programs as Electrical Week, LBE and Housepower is dependent upon the success they achieve, which in turn depends entirely upon what is done at the local level.

This was emphasized by J. Reed Hartman, chairman of the Electrical Industry Coordinating Group and vice-president of Cincinnati Gas & Electric Co., speaker at Thursday's general session. Hartman told of the group's formation and work to foster a better understanding among the various branches of the industry—an undertaking that has reversed the situation of a few years ago, when cooperation was greater at the local than at the national level.

Industry Is Interdependent

The electrical industry enjoys a healthy and vigorous competition within individual branches and is fortunate in having some of the large manufacturing companies. This competition results in advertising, which has done much to advance public acceptance of the electrical way of life, he said. But, large as these companies are, they cannot supply all of the components required in an electrical system, nor can they provide the manpower to distribute and install the equipment. Thus we have an interdependence which is not found to such an extent

J. J. Deuel, California Farm Bureau Federation, Thursday luncheon speaker



J. B. Anger, national radio sales manager, Motorola, Friday luncheon speaker

in any other industry, he declared.

The utilities, noncompetitive and with a definite stake in coordination, should assume the responsibility for coordination at the local level, he believes. The electric league, he said, has been found to be the most effective means of accomplishing this object.

If each one of the more than 4,000,000 engaged in the electrical industry were to promote actively all other branches, the impact upon the buying public would be tremendious, he pointed out. Future growth depends to a large extent upon the steps that are taken in each community to get the various branches to pull together as a team, he concluded.

The Trouble Is Political

California's water problem and the comprehensive state-wide utilization program (EWEST, August, p 75) was discussed in a forthright talk Thursday noon by J. J. Deuel, director of public utilities and water problems departments, California Farm Bureau Federation, Berkeley.

There is no shortage of available water, only disagreement as to what should be done, how it should be done and who should do it, he pointed out. "The problem is to overcome the desires of those who want the job done to suit their political fads and fancies and to get our elected officials to act more like statesmen and less like politicians; to recognize that the federal government still wants to control everybody's business and will do so unless elected state officials do a much better job in the future than they have to date."

Live Better Electrically

Advertising and other aids available through the LBE program were described by Helen Kirtland, consultant, Women's Interest, Live Better . . . *Electrically* project, at the Home Economics breakfast on Friday morning.

Miss Kirtland showed slides and film to illustrate the story of the industry's attempt to 'get its fair share of the consumer dollar by selling the basic benefits of electrical living and thus paving the way for individual brand advertising.

Live Better . . . *Electrically* will offer plenty of material in 1957, all leaving room for creative ingenuity locally and working toward better coordinated promotion on the local level. The big spring push is under way and the fall push is being planned, she said.

The payoff is great for every one in the industry and use of the LBE program aggressively will hasten the day when people will judge others by the standard of electrification in their homes, rather than by the make and year of car they drive, she concluded.

The Future Is Bright

We should not have anything but courage for the future; it has never been brighter, J. B. "Kip" Anger, national radio sales manager, Motorola, declared in his inspirational Friday luncheon talk.

The only thing to be concerned about today is selling and servicing methods at the dealer level, he emphasized. The retail salesman won't take time to learn his product.

Prices have not gone up enough and the customer is getting too good a buy. Obsolescence is the key word today. To get the job done at the retail level, creative selling is necessary, he stated.

Never forget the importance of human relations, he urged. "Where are we going to move our merchandise but to the same people who bought from us previously? You have to love your customer and he has got to know it!"

Agricultural Electrification

J. C. Porter, Chairman
D. W. Struck, Vice-chairman

Dan Weisser, General Electric Co., in reporting on applications of light on the farm impressed the group with this truism. Lighting, which is usually the first load on a farm, is many, many kilowatts from paying out its hand. Weisser's comments ranged from under-udder floodlighting in the milkhouse to black light bug luring applications that farmers use to indicate the proper time for sprays. Use of colored lights to emphasize defects in grading produce was highlighted.

Probably the largest load potential, however, was in the area of using light in plant growth. Under carefully controlled light conditions, plants will more than outgrow field-grown plants. By color control it is possible to raise spindly or stocky plants and by light-cycle control it is possible to pinpoint blooming dates. A tremendously important area of application will be in the area of hybridizing and strain improving since the maturing cycle can be cut to a half or a third by the use of proper light.

F. H. Coover, Southern California Edison Co., pinpointed the advantages to the utility company as well as to the farmer resulting from the use of a *well-engineered* overhead sprinkler system. While the farmer saves in labor expense, less erosion and gains a larger crop yield, the utility company gains with a larger return per installed horsepower per year as the result of using smaller equipments longer hours and thus easing the summer pumping demand problem.

Frank C. Miramontes, PG and E, evaluated the impact of the soil bank program in California. The short-range result will probably be taking of some $15,000,000 in goods and services out of the farm communities as a result of not growing on the land bank acreage. The long-term results of this program, however, would appear to make the farm communities sounder and healthier by bringing agricultural production

Krieg Brissenden Milby

more in line with national requirements and therefore reducing today's surpluses.

George H. Sullivan, Southern California Edison's personable dean of rural electrification, presented the Edison company's new public service farm safety film-slide *Look Up and Live*. The film is well done and should certainly be well received in farm circles.

Walter D. Howell, PG and E, and George Sullivan reported on meetings of the Interindustry Farm Electric Utilization Council, commending the energy and vigor being used by eastern groups trying to bring the electrical living on eastern farms up to Western standards. The comment was made that the efforts of these eastern groups were reminiscent of utility activities in the West 20 to 25 years ago.

Because egg handling requires more man-hours of labor, whatever automation can be introduced offers opportunities for further electrification. Roland C. Hartman, editor, *Pacific Poultryman*, described several mechanical aids to poultry raising, the most novel of which is a conveyor belt system to take the eggs as they are laid immediately to other parts of the processing for distribution of eggs.

California Committee on the Relation of Electricity to Agriculture, organized in 1924 by power companies and the University of California through grants in aid, has been declared one of the finest forms of cooperation between industry and education, Roy Bainer, University of California, Davis, reported. Indirectly perhaps, the 75 projects carried through the years have helped to make more than one-half of the total horsepower used on the farm, the electric horsepower.

Interesting new project is a study of controlled environment for feed animals, applying electric air conditioning in hot areas as in Imperial Valley. Beef animals gained four-tenths of a pound a day in a cool atmosphere. Amusing sidelight was that hogs found a refrigerated concrete slab pen so comfortable they would not move. Hence they got no exercise and lacked appetite to eat and grow in weight.

Electronics on the Farm

As a big industry working over wide areas, agriculture can use a great many applications of electronics, Fred Jacob, electronic application engineer at University of California at Davis, told the group. Two-radio radio systems are already used on large farms to coordinate equipment and men. Photoelectric color sorters and size sorters are used in packing plants. A tractor-mounted photocell device is used for thinning sugar beets. As farming adds complexities and quality measurements and sizing of products become more important, more uses can be found. With more reliable electronic equipment and better servicing facilities by dealers and distributors many possibilities lie ahead. Some of the "dream stuff" Jacob mentioned were herding of cattle with drone machines; opening barn doors and remote gates; television cameras for monitoring action in various parts of the farm; more precision batch mixing of feeds where concentrates, antibiotics and vitamins are added in small quantities; precise navigation of tractors down rows; even spacing of rows and irrigation leveling; high-speed weighing of cattle or stock; remote operation of water irrigation and sprinkling systems.

The 1956 project champions of the state in the 4-H clubs, two boys from Hanford, gave a demonstration of their home wiring and safety talk to close the session.

Heating & Air Conditioning

K. L. Hampton, Chairman
J. T. Bethell, Vice-chairman

No favorites were played in reviewing the full scope of various heating and air conditioning methods employing electricity at this full-day session Thursday. During the morning, J. C. Beckett of Wesix presented a complete paper on the "Primary Considerations for the Selection, Application and Ownership of Resistance Heating." This was followed by a similar paper by H. Z. Andrade, General Electric, on heat pumps, another on air conditioning systems by Fred Gabbard, Arizona Public Service Co., and another by Robert Ash of International Metal Products Co., Phoenix, on evaporative cooling.

With these as background, the afternoon session discussed dissemination of this information to the public. W. E. Hughes, Southern Nevada Power Co., recommended that PCEA publish brochures with the data from these papers in order that it may be applied in the field. Hampton suggested that to eliminate confusion of the sales information, the brochures be turned over to utility advertising departments for editing. It was felt by Hughes that rule of thumb rather than too technical data be given to make them of practical use to contractors and builders. This view was concurred in by Carroll Kiefer, California Electric Power Co., who reported that customers asked dollar-and-cents annual cost figures from utility power salesmen and not technical details. They want such information under conditions similar to their own. California Electric Power, in order to obtain it, has installed many meters to obtain cost data on the operation of systems in its territory.

Disappointing results of phone calls to architects and engineers and builders were reported by J. T. Bethell, Southern California Edison Co. Most of them declared they were not interested in the idea. They said when they wanted technical data they would get them from manufacturers. He had the opinion that mass designers and building contractors might be more susceptible to dissemination of the brochure, giving practical field data. It was the concensus that the brochure should sell

up the better capacity systems and play down costs. E. W. Meise, San Diego Gas & Electric Co., discussing problems in financing, suggested more contact with local FHA officials and financial agencies to acquaint them with electric heating and remove mental blocks that they apparently have against it.

Home Economics

Mary J. Kelly, Chairman
Dorothy S. Huse, Vice-chairman

Good ideas that click were brought to the home economics committee meeting by four utility home economists. Ruth Kruger, Arizona Public Service, told of her company's Kitchen Fun classes (EWEST, September, p 131) which attracted 1,000 children last year, with results in sales, increased kwh use and good public relations. Mary Means, San Diego Gas & Electric, reported on an all-out promotion of a Freezer school with a big response from dealers and public. Marjorie Helm, California Electric Power, described a specially built meter that can be read in pennies by a cooking school audience to show how little the electricity is costing during the demonstration. Marguerite Fenner, PG and E, showed some of the attractive slides her department uses to promote the correct use and care of appliances. *Homemaking Today*, a booklet, is sent to all organized groups within the service area and bookings for the slides are made through the local home economists, each of whom has a complete set.

A panel, introduced by Chairman Mary Kelly, Philco, told "What They Want." Mildred Movothy, Extension Specialist, Home Management, said that women want (whether or not they can express themselves) better service; to do a better job of using the equipment; consistency on part of advertisers, builders, educators on such matters as work areas and heights; adequate wiring; dealers to be better informed.

Let the students in on the planning and evaluating of the material you prepare at such cost, Helen Poulson, supervisor of homemaking education, Oakland Public Schools, urged in telling what the teacher wants. The material should be objective, written in children's terms, printed in large type, nothing less than 8 point and possibly 12 or 14 point, she said. A chart should accompany each piece of equipment that goes into the schools, telling how it is made, how to use and care for it.

Speaking for the homemaker, Carmen Roden, formerly a home economist and now a homemaker herself, said that young families who cannot afford de luxe models do not want safety and convenience features left off the lower priced models, would prefer to do without trim and color. Other things her young married friends want are removable oven doors; pull-out oven linings; timers on all range models; range controls out of reach of the children. In refrigerators there is sometimes not room for the door swing necessary to roll out shelves. Young mothers would like instructions fastened permanently on appliances because children tear up the books; a part load setting on the washer; a roll-around vacuum that will not tip over when little folks ride on it and that has a retractable cord.

The meeting closed with a report from Helen Kirtland, consultant on women's interests, Live Better . . . *Electrically*, on the recent three-day women's conference in Chicago. The group spent two days studying ways to dramatize the story of electrical living and get it across to women. The third day was spent in the Merchandise Mart inspecting new models.

Home Lighting

Willard Hird, Chairman
Jerre C. Blair, Vice-chairman

Home lighting, too long neglected, could be a profitable business for the entire industry in dollars and cents as well as in customer good will, it was brought out at the residential lighting session on Thursday morning.

Residential lighting has desirable characteristics such as high load factor, it requires little added investment to serve and can be added in small increments, but there are some little known factors such as cost of obtaining the business, Walter Lind, PG and E, stated. The industry needs more specific information on load characteristics and must solve two questions: (1) how to create customer desire; (2) how to make it easy to sell and install.

Dr. Henry B. Peters, associate clinical professor, School of Optometry, University of California, made the point that optometrists can say things about lighting that the electric industry cannot say without being accused of "just trying to sell light bulbs." Optometrists have been sitting on their hands too long while the electric industry has been carrying the ball, he believes, but now they have a program to present on a local level in cooperation with utility or manufacturers. Peters told of a 30-minute program that optometrists are presenting in southern California, with emphasis on the fact that home lighting should be planned.

While lighting—now in the privy stage—is the last thing the builder uses to sell his house, he is beginning to ask for information, which utility and manufacturer can give him, William Lapham, Lapham Construction Co., Oakland, stated. Because the glass people have pushed day lighting, the builder uses about 10 times more glass today. Home lighting is the greatest single field the electric industry can attack, he declared, and advertising should be slanted to show its use in new homes, most of which are sold by day.

The building contractor doesn't

Home economists tell good ideas: Mary Kelly, Philco; Ruth Kruger, Arizona PS; Mary Means, San Diego G&E; Margorie Holm, Calectric; Marguerite Fenner, PG and E

Clark Chamberlain, section vice-chairman; Willard Hird, home lighting head

Kitchen and laundry committee panel: M. V. Musy, Westinghouse, vice-chairman; C. L. Neibel, Edison company, chairman; T. L. Cruse, California Electric Power Co.

have time to be a specialist in all things but the utilities have lighting specialists and he should use them. Good lighting probably would equal the cost of one or two of the appliances "we now so generously give," Lapham said. "Why shouldn't all the lighting in the house get the allocation of one appliance?"

Trained salesmen are what the retail dealers need, Thomas Clarey Jr., manager of Macy's lighting department, brought out. Retail dealers should sell not a fixture but something to go with the decor; they should size up the individual customer, talk with him, then sell adequate lighting to go with what he has in his home. "What has the lighting man done? Nothing. Now is the time to take advantage of the tremendous building and modernization boom."

How a utility can demonstrate light for living was shown by Robert Haskell, PG and E. Using a magician's tricks to bring home some basic facts about lighting, Haskell entertained as he instructed. The performance was a sample of those Haskell is giving throughout PG and E territory.

The final part of the home lighting program was taken up with reports of the surveys on what is being done by the industry to develop sales. R. P. Burbank, Southern California Edison, reporting for the utilities, said that residential lighting had been neglected too long, that the utilities need training aids, that by selling lighting they can benefit everybody, including the customer.

Pointing out again that people go from offices having 50 f-c or more to homes with about 5 f-c, George Baker, Graybar Electric Co., spoke of the need for utilities to ask lighting fixture manufacturers to come into the programs they are sponsoring. With the cooperation of all the job can be done, he said. The distributor has never taken an active part in the program, he said, and "we can't educate others until we are educated ourselves." With the cooperation of all the job can be done, he said, and residential lighting will then take its place as a necessity and not a luxury.

Residential Adequate Wiring

W. H. Gribble, Chairman
W. W. Bryan, Vice-chairman

How the Housepower idea was taught to electrical contractors and the successful system that has been developed to follow up with actual sales was the outstanding feature of the residential adequate wiring committee session Thursday afternoon.

The first part of the program reviewed the accomplishments of the 1957 program (Walter H. Abraham, PG and E), what the 1957 program will be (Carl C. Mak, PG and E) and the local action plans of Southern California Edison (J. W. Enarson) and California Electric Power (C. E. Kiefer).

W. R. Milby, Detroit Edison Co., described the program now being operated as the joint responsibility of Detroit Edison and the Electric League of Detroit. "Housepower Forums" were first conducted as a sales educational program to reach and organize into effective selling the electrical contractors. It was felt that consumers who responded to the Housepower promotion and advertising should have some place to go to channel their desire for rewiring and produce results. Hence, the contractors' services department was set up through which to pool all inquiries.

Membership in the group was offered to all contractors and 40 joined. All inquiries are rotated to members within their boundaries. There are few rules: (1) that all calls must be answered promptly; (2) that all types of service and modernization work must be performed, not limited to large jobs; (3) that the contractor have good standing and reputation, and attend five out of six of the forum classes.

Milby reported a quick change in contractors' reactions from that of "show me" to enthusiastic cooperation and even financial participation in advertising and publicity.

A home builder and electrical contractor presented enthusiastic viewpoints on behalf of the Housepower program. Thomas W. Yeandel, building contractor of Castro Valley, described his experience, first with a small tract in 1950 and buyer response to the all-electric homes. While purchasers often were not aware of the benefits at first, after living in the home they became the best salesmen for the adequately wired home to others.

C. R. Jones, Jones Electric, Hayward, has made use of the advertising value of adequate wiring Housepower in a great many tract homes in the Bay area wired by his company. He uses the sticker, designed by himself, offering the fully adequately wired home at an alternate price. This is affixed to the bid form and has resulted in the sale of the better jobs in many tracts.

Carefully explaining the limitations of FHA standards, Benjamin F. Byrnes, chief architect, FHA, San Francisco, closed by offering to meet with a PCEA committee in considering revisions of the wiring standards. A motion was passed unanimously to send such a committee to FHA immediately.

What the electrical supplies distributors are doing to promote the Housepower program was well sum-

marized by Lee S. Prince, Westinghouse Electric Supply Co., Los Angeles. While not directly in contact with the consumer, the distributor, she said, derives benefit through sales of supplies to all branches of the industry as the result of increased housepower to the homeowner. He described the NAED program and then told examples of specific distributor programs in Spokane, Eugene, San Francisco and San Diego to further both the Live Better . . . *Electrically* and Housepower programs.

Kitchen & Laundry

C. L. Neibel, Chairman
M. V. Musy, Vice-chairman

Greeting his audience with a shower of pennies and the statement "Just throwing money away, that is what happens when dealers don't take advantage of the market that is there," C. L. Neibel, Southern California Edison, introduced a lively panel on the kitchen and laundry.

The appliance dealer has lost his market to the builder, he admitted, but today's tough selling market is the dealer's big chance if he has the answer and it is the industry's problem to produce that answer, Neibel believes. The industry should recapture the market from the builder but at the same time help that builder.

Bringing the meeting his observations from the recent NAHB convention and facts from a report by *House & Home*, Neibel said for the first time since the war the merchant builder is urgently—almost desperately—reaching out for help. The modern kitchen — now the focal point in homes with built-in appliances—is becoming too complex for the average builder to cope with but, if the potential buyer doesn't like the kitchen, the builder loses not only his sale and the money invested in it but the sale of the house in which he has thousands invested.

When houses were easy to sell, maybe all the builder wanted was a lower price, Neibel said. But with today's competition, which is forcing builders to change and improve their houses faster than ever before, he's a lot less interested in price than in sales appeal. Here is where the smart dealer turned kitchen specialist can really make good, Neibel thinks. It is a good time to get in the market because the tendency today is to sell from models, so that there is less money tied up and designs can be changed as public taste changes.

W. H. Gribble, chairman, adequate wiring committee, and Miss Housepower

T. W. Yeandel, Castro Valley, and C. R. Jones, Hayward, AW speakers

The home improvement market also is good and here again the dealer might "join 'em," Neibel said. Lots of good small contractors are looking for work and it was suggested that the dealer "marry up" with them to avoid getting a B-1 license, which he would need to become a specialty contractor.

What Is a Kitchen Specialist?

Seeking to define terms, M. V. Musy, Westinghouse Electric Corp., reminded that the places who list themselves as sellers of kitchens include almost everything except a funeral parlor and that a dealer who says "I sold 50 kitchens last year at an average price of $3,500," isn't talking about the same thing as the one who says "I sold 115 kitchens at an average of $800."

If we define a kitchen as the cooking department of the house, we must remember that it includes all the facilities and equipment necessary—at least five elements: space, functional equipment, storage facilities, work surfaces, decorations, he said. A kitchen specialist then is a man who concentrates on providing all five elements. A case study of 10 kitchen specialists shows that:

1. He may sell kitchens only or he may operate in combination with another business but always as a separate department.
2. He is well established and he intends to stay in the same business for a long time.
3. He devotes at least 500 sq ft of space, an average of 1,000 sq ft, to the kitchen operation.
4. He usually has three or more displays. The minimum is often established by the number of cabinet brands he handles.
5. He has two or more full-time people plus part-time employees and subcontractors.
6. He does a minimum of 40 kitchens a year, usually 80 to 150.
7. The kitchens he sells have an average price of between $2,000 and $4,000. The yearly volume of the 10 dealers used in the study ranges from $115,000 to about $440,000.
8. He concentrates on modernization; does very little business with speculative builders; is emphatically an expert in selling to individual customers.
9. He does the complete job, including the more important elements of decoration.
10. He makes a good profit.

The backgrounds of men who have been very successful in this business are surprisingly varied, Musy said, but they all have two things in common—a deep interest in the finished product and "guts."

Capital Needed

Properly a man beginning a new kitchen business needs a substantial amount of capital. Estimates by successful kitchen dealers range from $10,000 to $100,000. Musy said he thought there should usually be about $35,000 to $40,000 available for a new business; if it is an additional department only $15,000 to $20,000 may be required. It should be possible to get into the black in six to nine months after starting, if there was enough capital to begin with, he believes.

A high degree of natural floor traffic is not essential so the kitchen dealer's store can best be located out of the high-rent downtown area, with good parking facilities.

The new kitchen specialist should select a good appliance line since more and more often it is the equipment that sells the kitchen. His gross in the business will depend on being able to reach people of modest incomes and for this a liberal finance plan is essential.

He must select cabinet lines, more than one, must provide adequate arrangements for installation and must do his own designing. An outside design service is usually unsat-

D. V. Doub, PG and E; Ed Wismer, Wismer & Becker; L. L. Mattmann, Westinghouse, K. S. Oliphant, consulting engineer; Chairman W. L. Greer, commercial-industrial power

At commercial and industrial wiring meeting: Gordon Black, Rome Cable; Paul Henrichs, Edison, chairman; U. G. Karrer, PG and E; Chick Demming

isfactory because the customer needs to feel a part of the process.

This is a business in itself, Musy concluded. It is not easy to get into it. There have been many failures. You cannot be in it with one hand. "You should get the best advice you can, make sure you have *all* the basic requirements, that you have considered your market carefully and selected the right brands of cabinets and appliances — then put your whole heart and soul behind it. If you render a better service to the customer under these circumstances, you'll be like the man who told us 'I did $230,000 last year and netted 10%.'"

Financing

T. L. Cruse, California Electric Power, brought the meeting the benefits of a study he made of financing. He believes that financing for new dwellings need not be too much of a problem for dealers but agrees that older homes present a problem. FHA Title 1 does not fit this type of business, he pointed out.

Auto dealers take all the pain out of financing for the customer and a kitchen specialist must do the same, he thinks. He can't depend on the customer to make the arrangements for financing if he wants to make the sale.

The kitchen specialist should work with the lending people as closely as with the plasterers and others concerned, he advises. The contractor who has moved a lot of appliances often doesn't know the names of them. It is time the utilities and manufacturers made some effort to assist the dealer in financing to get him back in the appliance business, Cruse declared.

During the discussion that followed, a resolution was passed by the group urging PCEA members to write their congressional representatives asking that FHA loans continue to cover appliances.

Commercial-Industrial Power Utilization

W. L. Greer, Chairman
W. E. Vaughn Jr., Vice-chairman

Air conditioning serves either or both of two purposes industrially, said Thomas A. Marshall, York Corp. These are to control conditions necessary for product quality and to promote production efficiency among the personnel. After enumerating numerous examples and illustrating some with slides, he discussed the new air source heat pump. This utilizes a system long known in refrigeration as compound compression, in order to derive heat from air even below zero temperatures without supplementary heating.

The possibilities of using electronic cooking in industrial and commercial establishments, either for restaurant use or for in-plant feeding, was discussed by George Klopp of Hotpoint Co. Because most food purveying operations are marginal with low average income and high mortality rate, there is little possibility of a market among small restaurants. Power demand is very low and for very short intervals. There are yet many other problems to be solved, such as the assigned frequencies by the Federal Communications Commission with which such cooking devices must not interfere, particularly in the defense bands.

Most interest in the question period centered around the appearance, taste and quality of the food, its timing requiring far greater accuracy than ordinary cooking methods. Both Klopp and Joe Gray, representing Raytheon radar range, answered questions of that kind.

Capacitors, their characteristics, applications, types, and who should install them—utility or customer—was made the panel subject of a lively group presenting utility, manufacturer, consulting engineer and contractor. Larry Mattmann, Westinghouse, was moderator, both introducing the subject and summarizing the benefits at the end.

Donald Doub, PG and E, declared that while it would probably be more economical perhaps for the utility to correct power factor and it would benefit the utility to do so at the substation many of the owner benefits would be lost unless capacitors were placed near the load. The Public Utilities Commission has ordered all utilities to restudy the entire subject.

Ken Oliphant, consulting engineer, represents the client, he said, and he must have reasons for selling his client on installation of capacitors. He reviewed the shunt and series types and their applications. Significant point made was that in old industrial plants use of capacitors releases dormant capacity in the system. Where power factor is only 40-50% by increasing it to 75-80%, more load can be carried on existing wiring systems. In new plants, capacitors can insure future growth of the wiring system as much as another 20%. Distribution energy losses are likewise reduced, enough in many instances to pay off the capacitor installation in a short time. With automation, where speed control is important, regulation is difficult with ordinary means but capacitors keep voltage levels to the required limits.

Ed Wismer, electrical contractor of Sacramento, said contractors often have to advise their customers, where they do not have consulting

engineers, and he discussed many practical aspects of installing and locating capacitors near load centers. Sometimes he has to describe whether to use capacitors or synchronous motors, depending upon other loads in the plant.

Commercial-Industrial Lighting

Charles D. Buchanan, Chairman
Clem Smoot Jr., Vice-chairman

That the Illuminating Engineering Society's standards compare poorly with recommended levels of illumination in the West was brought out by Frank Lee, General Electric Lamp Division, who showed a number of installations of 100, 200 or 300 f-c levels. The recommendations of the IES standards fall far below such levels.

Certified lighting progress in California was reviewed by a symposium consisting of John S. Walsh, PG and E, chairman, C. H. Thrane, General Electric Supply, Los Angeles, and E. W. Meise, San Diego Gas & Electric. The number of certified lighting classes, the promotional programs and the results in the field in each of the three areas were described.

Selection of ballasts can be as important a matter as selection of light distribution patterns, it was brought out in a review of this often controversial subject by Reese Gwilm, General Electric Co., ballast department.

How the luminous background for show windows can overcome daylight reflections was graphically shown to the group by means of slides made from actual test installations in northern California. R. L. Sawyier, PG and E, made the presentation.

Commercial-Industrial Wiring

Paul Henrichs, Chairman
Gordon F. Black, Vice-chairman

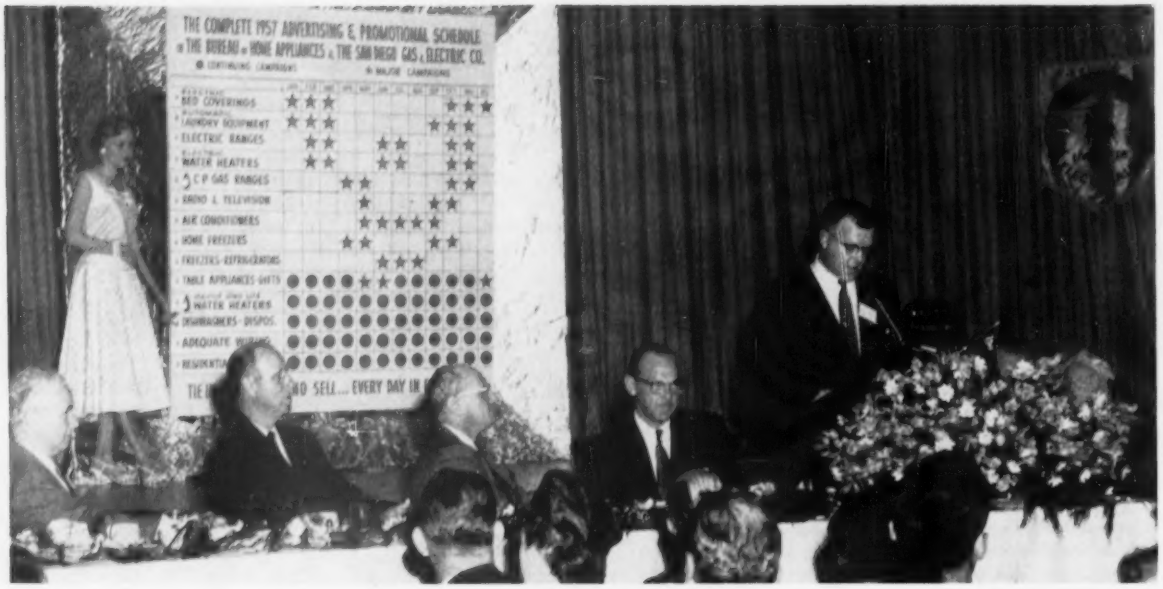
Results of a survey made by letter to owner investors in commercial buildings, architects and electrical consultants, written over the signature of the president of PCEA, were told by Gordon F. Black, Rome Cable Corp., and U. G. Karrer, PG and E. The letters asked the help of the recipients in telling the PCEA commercial and industrial wiring committee what help and what data or information they would like to have from the electrical industry to guide them in planning for the future electrical uses of their properties.

Out of the 100 letters, 55 letter answers were received and a number of telephone calls. The architects liked the idea of having some source of information available. There were fewer responses from the electrical consultants, building owners and investors. In the order of requests, the data required would consist of (1) selected information on load trends and usages of electricity in commercial buildings; (2) possible reprints of important articles containing such information; (3) trends in electric design in modern buildings; and (4) such information be in letter size for filing. Other contacts resulted with the AIA construction council. Liaison with the professional and trade groups of the architects and building owners was suggested. At the close of the meeting, motions were passed to refer follow-up to next year's committee and also to have PCEA belong to the Producers Council which offers a medium for such contact with architects.

The meeting ended with a description of wiring for air conditioning in the subway terminal building and Santa Fe Railroad building, prepared by Sidney F. Hill, Hill Electric Co., Los Angeles, and read for him; and a description prepared by Chick Demming, Demming Electric Co., of the wiring for air conditioning at Sears Roebuck stores.

Eva Gabor (shown in picture) and Jerry Colona appeared in the appliance section of Kahn's at Oakland, Calif., to aid Hungarian relief. Their appearance was sponsored by Hotpoint in recognition of the store's outstanding merchandising activity. It was one of 15 winners in Hotpoint's 60-day display window contest

Dealers from two counties, San Mateo and Santa Clara, met to hear the local promotion programs for hitching up the Housepower and LBE programs in 1957. Chairman Collis Williams, Hales, San Jose (at microphone), presented Jack Ross, Pacific Gas and Electric Co., Harry Gough, G-E Appliances, Gilbert Hamilton, Frigidaire, to outline the national support promised local activity on all drives



Bureau program is reviewed by Norman Foster, Barnes-Chase Co., with aid of Helen Landon, 1957 Maid of Cotton

Learn to Sell Profitably

Dealers hold the power to direct their own future in the appliance-TV business, but they must exercise this power to put manufacturers and distributors on the right track, Leonard O. Truesdell, vice-president and director of sales, Zenith Radio Corp., Chicago, told nearly 500 members of the Bureau of Home Appliances of San Diego at its annual Winter Conference. On the same program were Ed Barnes, national sales manager, Kelvinator; Milton Jewett, Western regional manager, St. Charles Kitchens; and Henry Horner, head of Standard Enameling Co.

Truesdell said that the radio and television industry is building a "Frankenstein" through overproduction, ineffective advertising and the theory that "selling down" can be profitable. He noted the industry's "goof"—500,000 too many TV sets, 400,000 too many radios in inventory at the beginning of 1957. The answer, he said, is for dealers individually to urge manufacturers to produce in line with market demands—the retailer must stand up and say "we are the power in this business."

In spite of present problems, Truesdell saw only a happy future for the retailer who learns to sell profitably in this economy. He saw this ahead: (1) more radios going to be sold as a result of transistors and other advances that will obsolete the millions of radios now in the homes; (2) spectacular advance in the sales of hi-fi, already evidenced by the trend of many in the public to take considerable time away from TV to listen to music; (3) a steady leveling of TV sales at about 7,000,000 units

Leonard Truesdell with Ed Nystrom

Milton Jewett and Henry Horner talk with Clark Chamberlain before the meeting

a year—a plateau of sales that will be set by the steady demand of sets for replacement plus the steady demand resulting from the establishment of new families.

In planning for a profitable future in this industry, the appliance dealer must first decide which approach he wishes to take, and then concentrate on it, said Barnes. The dealer has the choice of being a "large volume, low-unit profit operator or a small volume, larger margin dealer"—but he can't straddle the fence, he said. To be successful as a small dealer involves being a creative salesman, Barnes noted. He pointed out that the automobile dealers make their profits on selling accessories, not cars, and that the same approach would have to apply to the dealer who would make his profit in "selling up." He deplored that our industry features "stripped goods" and that it is difficult to move the customer to the high-end models where the profit lies. He pointed out that it costs the dealer no more to carry and feature the high-end goods and that there is no extra cost in carrying the customer for high-end models.

For the average appliance dealer, the answer to profits in the kitchen business is to tie in with a local kitchen specialist who is equipped to do everything about remodeling except supply the appliances, C. M. Jewett said, in his talk to the San Diego dealers and distributors. He deplored the attitude of industry trade papers that, he stated, ". . . discourage all but the very large and financially strong dealer . . ." This is not necessary, he inferred, because the interested dealer can give the customer ". . . all the data on built-ins he handles and could certainly get an order if he could offer this customer the full service of kitchen planning and of handling the details necessary in carrying the job through to a successful conclusion." Cooperation between the appliance merchandising dealer and the trained kitchen modernizing specialist is the true answer to full and profitable development of the kitchen business, Jewett said.

San Diego County dealers and distributors heard a glowing account of the progress of their county from Anthony Borthwick, president of the First National Bank and member of the Federal Reserve Board. Ed Nystrom, president of the bureau, presided at the meeting. Program chairman was William Marsden. Bureau Secretary-manager J. Clark Chamberlain coordinated the activities of the sales conference.

NCEB Committee: Ross, Falge, Reynolds, DeBonis

IN northern California the electrical bureau spearheaded its celebration with a $20,000 prize award program. Committee in charge of the week: F. M. Falge, LBE, chairman; B. W. Reynolds, bureau manager; J. S. C. Ross, PG and E, vice-chairman. G. S. DeBonis is president of the bureau. A special activity was carried on in the schools by a committee of electrical inspectors. . . . In southern California at an Electric Club meeting Ed Marten, president of the Los Angeles Electric League, and R. D. O. Nicholson, chairman of the day, presented Miss A-C and Miss D-C. . . . In San Diego the Electric Club and Bureau of Home Appliances sponsored a luncheon with Harold P. Field, Stromberg Carlson, J. Clark Chamberlain, bureau manager, H. G. Dillin, San Diego G & E, Robert Kinslow, Electric Club president, as speakers

Marten Miss A-C Nicholson Miss D-C

Kinslow Field Dillin Chamberlain

Facts about ELECTRICAL WEST

CIRCULATION continues to grow in pace with market – currently over 11,500 paid.

EDITORIAL development includes three new regional editors in 1957, expansion of news coverage and enlargement of editorial advisory board.

MARKET growth continues at faster-than-national level. Western utilities will spend $1.016 billion in 1957. Every dollar spent for utility expansion is matched by one for *wiring supplies, lighting equipment* and other parts of the electrical system by power users!

BUYERS GUIDE & DIRECTORY is published as 13th issue in November. Used by Western electrical buyers for 25 years. The only Directory of Western sources for all kinds of electrical equipment. Advertising forms close September 20.

THE ELEVEN WESTERN STATES comprise the fastest growing segment of the electrical industry, will receive 21% of the nation's power system construction expenditures in 1957. These states account for 23.6% of the country's total backlog of engineered construction, and for 24.1% of all housing starts. In this huge and unique regional market ELECTRICAL WEST has more circulation – by far – than any other electrical magazine. It is worth serious consideration for every electrical equipment advertising schedule.

ELECTRICAL WEST

Spokesman of the Electrical Industry of the West for 70 Years

To ELECTRICAL WEST's Kilowatt-hour Contest Editor

Here's My Forecast

The annual kilowatt-hour output for the 11 Western states for the year 1957 will be ..... kwh.

Here's why (in 25 words or less). .....

Name .....

Title or job .....

Company .....

Address .....

City .....

State .....

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State .....

Announcing

A New Annual Load Forecasting Contest

West's Kilowatt-hour Load Forecasting Rodeo

A Chance To Put Your Brand on a $500 Block of Stock of a Western Utility

The Object — To forecast the total kilowatt-hour output of the power stations in the 11 Western states for the year 1957. Federal Power Commission figures of kilowatt-hour output will be the basis of judging the winner. Winner will be announced in the April 1958 issue of ELECTRICAL WEST.

The Contestants — Any person employed in any segment of the electrical industry in the 11 Western states, Hawaii or Alaska may submit one entry in the contest—using the attached postcard or a reasonable facsimile thereof. Entries must be postmarked not later than June 30, 1957. Employees of the McGraw-Hill company and its subsidiaries are ineligible to participate.

The Prize — ELECTRICAL WEST will award the winner, who comes closest to the actual official FPC kwh output figure, $500 worth of common stock in one of the electric companies serving an area of the 11 Western states. The electric utility whose common stock will be the prize will be determined by a drawing held at the annual Pacific Coast Electrical Assn. convention in San Francisco, Calif., May 15-17, 1957. Stock representing the prize will be purchased immediately after the drawing and held in escrow with any accrued dividends until the winner has been determined. In case of ties, the prize will be divided equally between those submitting the winning figure.

A Hint — In 1956 the official kilowatt-hour output figure for the 11 Western states was 113,501,734,000 kwh as reported by FPC.

If card is missing, use facsimile on opposite page.

It's Fun — It's a game of skill — **and a test of your optimism about Western growth. Calculate what this figure will be for 1957! It costs nothing to enter the contest. Just send in your estimate on the attached card, by letter or other postcard.**

To ELECTRICAL WEST's Kilowatt-hour Contest Editor

Here's My Forecast

The annual kilowatt-hour output for the 11 Western states for the year 1957 will be ..... kwh.

Here's why (in 25 words or less). .....

.....

.....

.....

Name .....

Title or job .....

Company .....

Address .....

City ..... State .....

Put Your Brand on $500 of Stock

Use this Card to Enter

ELECTRICAL WEST'S

—Kilowatt-Hour Rodeo—

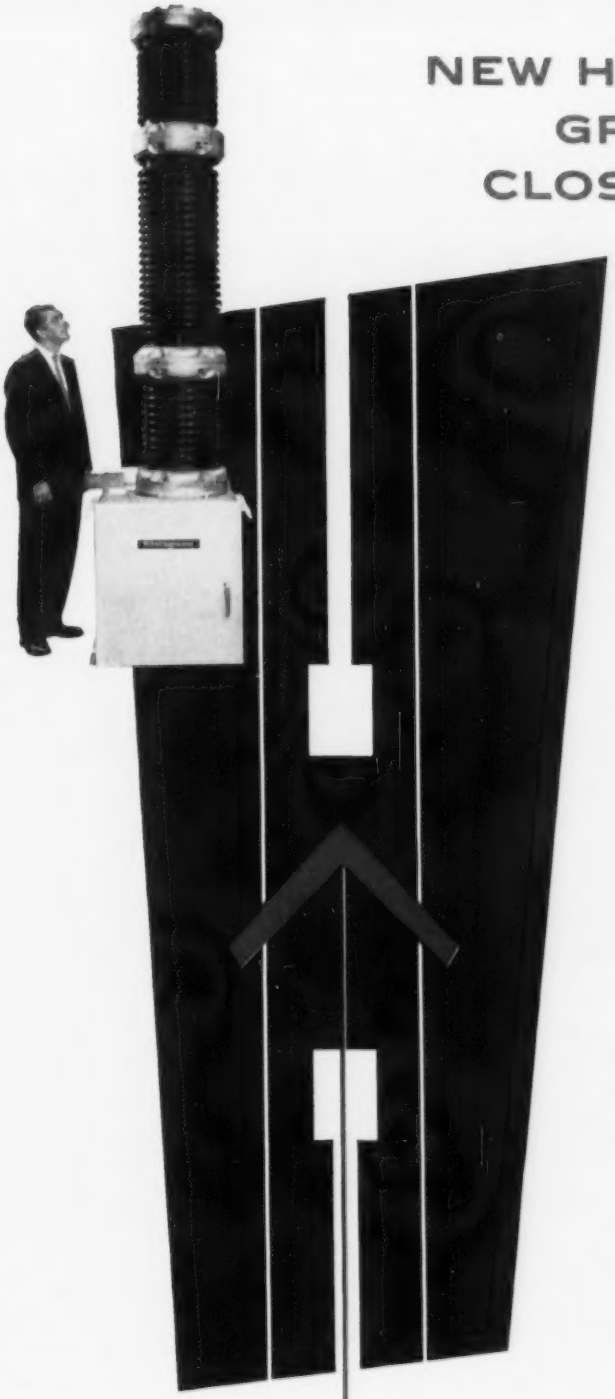
See preceding page for full details

If card has been torn out when you receive this copy, send your entry on facsimile opposite preceding page.

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

Electrical West's Kilowatt-hour Rodeo
68 Post Street
San Francisco 4
California



NEW HIGH SPEED GROUNDING SWITCH CLOSES IN 5-CYCLES

Applied by P. P. & L. to Protect Large Power Transformers by Initiating Tripping of Remote Circuit Breakers*

Six times the speed of conventional grounding switches—fully enclosed and impervious to weather. It's revolutionary in design.

The 196-kv unit illustrated is one of two units at the P. P. & L. Peckville substation. In case of trouble in the zone protected by the transformer differential relays, the relays operate the grounding switch, initiating a ground on the line. This ground fault trips circuit breakers at the remote end of the line and clears the circuit before extensive damage can occur. This scheme is much more economical and just as reliable as other methods of protection.

The contacts and mechanism are fully enclosed. Blade action is reciprocal instead of swinging. Closing time is minimized by locating the contact structures relatively close together in an atmosphere of high-dielectric sulphur hexafluoride gas. The entire assembly is sealed so that replenishing gas is not necessary more often than every two or three years. The SF_6 itself does not deteriorate. Icing and temperatures as low as –40° have no effect on reliability or speed of operation.

Other voltage ratings of 69-, 115-, 138- and 161-kv will be available shortly.

Complete information, including user application particulars, is available from your Westinghouse sales representative.

J-60904

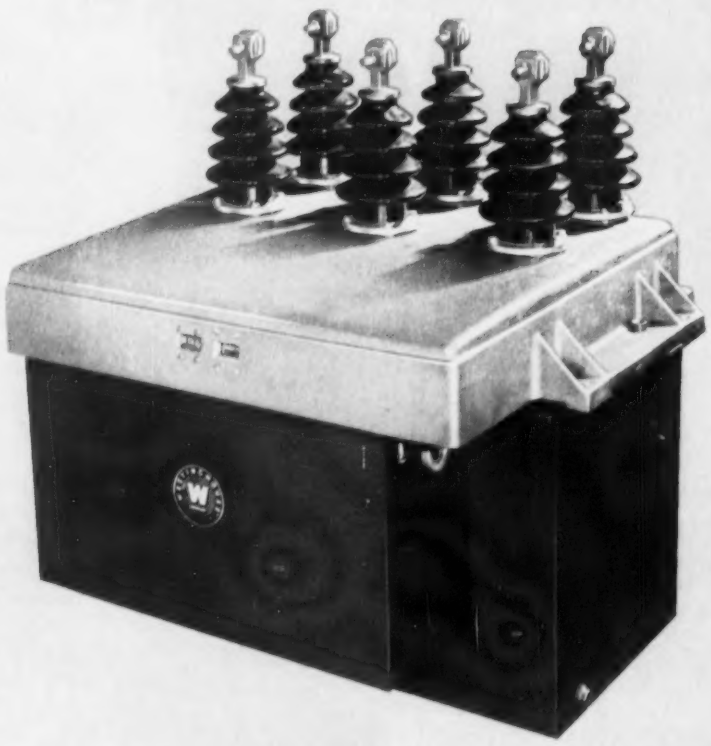
* Pennsylvania Power & Light Company was the first utility to plan the application of high-speed grounding switches. Westinghouse was commissioned by P. P. & L. to develop a 196-kv grounding switch capable of closing 20,000 amperes in five cycles instead of the conventional fifteen to thirty cycles.

YOU CAN BE SURE...IF IT'S

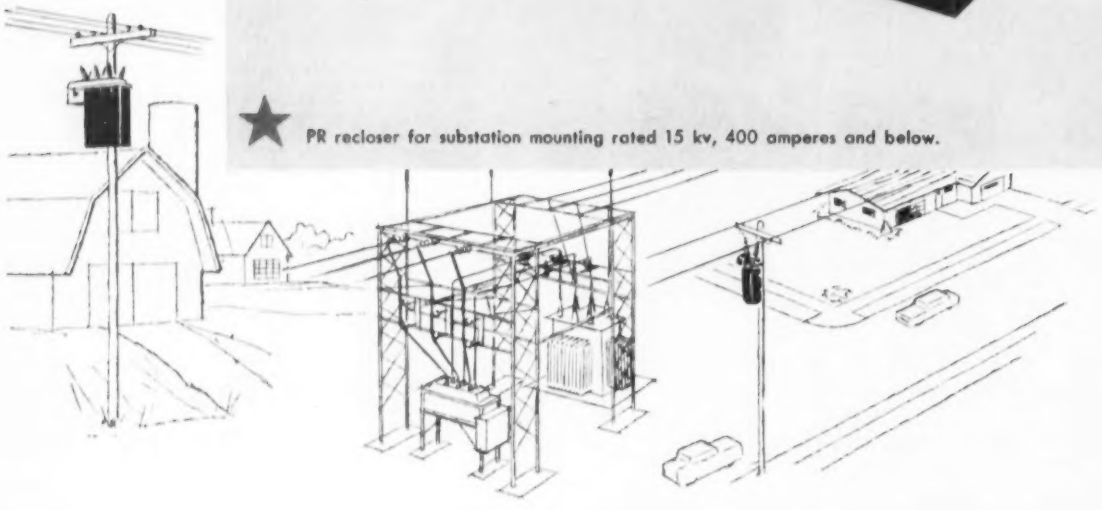
Westinghouse

THE WESTINGHOUSE RECLOSER LINE PRESENTS...

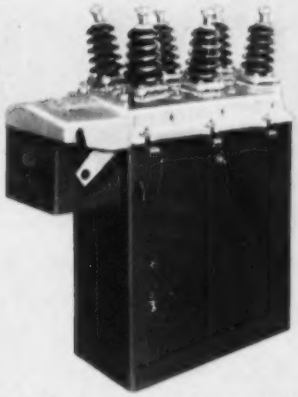
Featurama...an unmatched



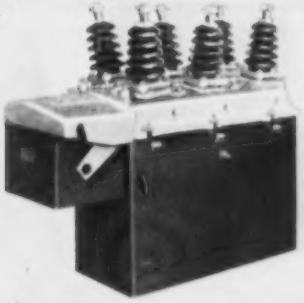
★ PR recloser for substation mounting rated 15 kv, 400 amperes and below.



but widely imitated all★star production



★ GR-3, 100-ampere automatic circuit recloser. Three-pole, 2,300 to 15,500 volts.



★ GR-3, 50-ampere automatic circuit recloser. Three-pole, 2,300 to 15,000 volts.

★ Type GR, 100-ampere substation recloser. Single-pole.

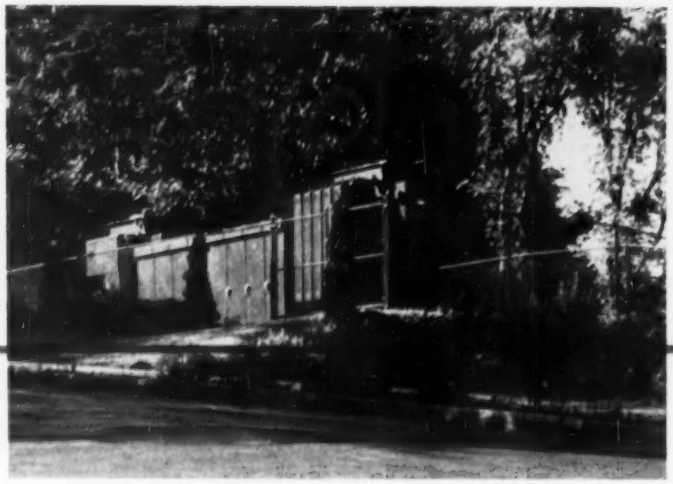
★ Type GR, 50-ampere line recloser. Single-pole.

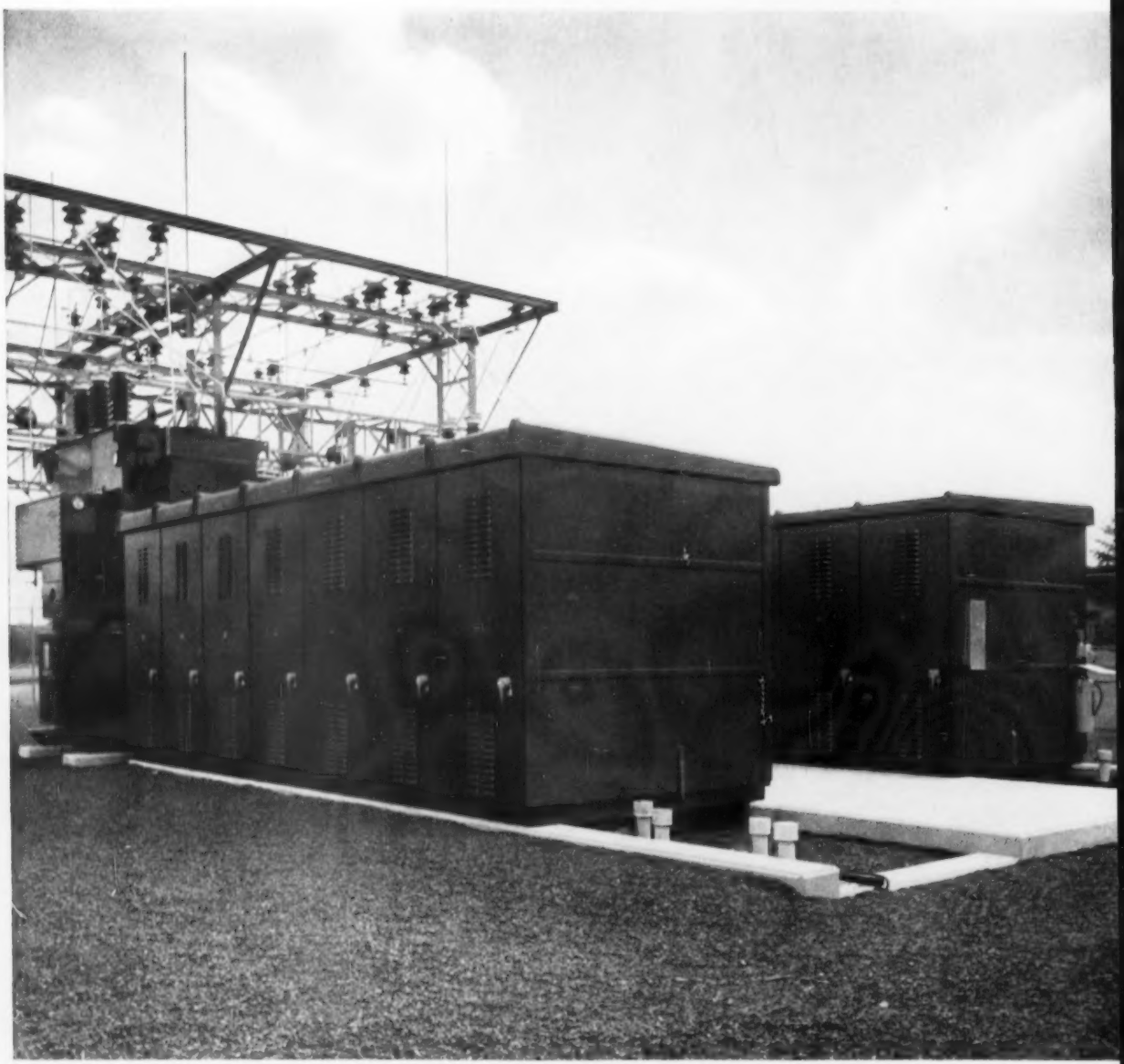
★ Get these NEW features: ★ Big operation counter can be read from the ground—the only one that can be reset. ★ One-piece aluminum head casting gives better seal, less maintenance, longer life. ★ Manual operating handle shaft-sealed against dirt and moisture. Plus these long-time standards: ★ One-half to two-thirds as many parts. ★ Simple, reliable. ★ Exclusive De-ion® interrupter arc-quenching. ★ Single operation to lock out if manually closed on fault, not full-automatic cycle with resultant extra wear. ★ Time delay on manual close on cleared circuit rides through inrush load pickup. ★ Seamless, weldless, galvanized drawn-steel tank eliminates need for painting. ★ Integral surge and lightning protection in bushing-mounted arrester. ★ Two-to-three-cycle opening and power restoration. ★ Hydraulic timing—nine combinations of instantaneous and time-delay operation. ★ Bushings, coils and contact details interchangeable in 50- and 100-ampere series. ★ Built to the quality standards of the Westinghouse circuit breakers. ★ For complete details, ask your Westinghouse sales engineer or distributor for booklet B-4339—or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-60921

YOU CAN BE SURE...IF IT'S Westinghouse®

Unit substations designed to grow... and to be good neighbors





BUILT-IN FLEXIBILITY TO ACCOMMODATE LOAD GROWTH, LOAD SHIFT

Planning for the future—in load growth and load shift—with minimum capital outlay today is a universal distribution problem. Westinghouse anticipated it—designed unit substations that can grow—and be good neighbors in residential areas, too.

For instance:

The box-type throat connection allows simple transformer interchangeability.

Standardized metalclad switchgear makes addition of feeder units economical and visually attractive.

Single-end stations can become double-end with a minimum of installation time and manpower.

Appearance and new low-cost transformer soundproofing make them more acceptable—for less of your money—in thickly populated residential areas.

Moreover, *all* components of Westinghouse unit substations are engineered and coordinated by *one* manufacturer with complete control of design, manufacturing and assembly. Discuss your requirements with your Westinghouse sales representative and learn the full extent of the advantages to be gained. Or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa., requesting DB 34-250 for additional information. J-60914

YOU CAN BE SURE...IF IT'S

Westinghouse

A Westinghouse Exclusive

A FOUR HOUR LOAD PICKUP JOB DONE IN FIVE MINUTES

. . . by two new Westinghouse automatic load pickup switches.

Manual restoration on the same circuit, by conventional sectionalizing methods, required four hours and much man power. The line covered 75 circuit miles of 6.9-kv service, with 1309-kva transformer capacity. Under automatic load pickup re-energization, *no protective equipment was subjected to overload for more than one-half cycle.*

The Westinghouse LP automatic load pickup switch is a 15-kv, 200-ampere unit for all voltage ratings from 2.3- to 15-kv. Thermal time-delay is available in increments of two seconds to five minutes. Complete details are available from your nearby Westinghouse sales representative—or by requesting Bulletin 38-860 from Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60909

For a complete engineering report on the application described, write the address at left, asking for reprint No. 5235.

YOU CAN BE SURE...IF IT'S

Westinghouse

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

Mr. E. C. Carter, Carter Electrical Construction Co., Pittsburgh, Pa.

"Hang quickly... line up easily"

"One of the biggest timesavers in the business is Day-Brite's 'A-J' adjustable stem hanger. Designed to let you hang fixtures quickly and line them up easily and accurately, the 'A-J' hanger is a real money saver.

"In a lot of ways, the 'A-J' is a small thing. But, it's the small things that count—often make a big difference in a job profit.

"That's why we like Day-Brite. The folks at the factory pay attention to the smallest details—have a complete understanding of the contractor's problems—make it easier for him to speed up installation."

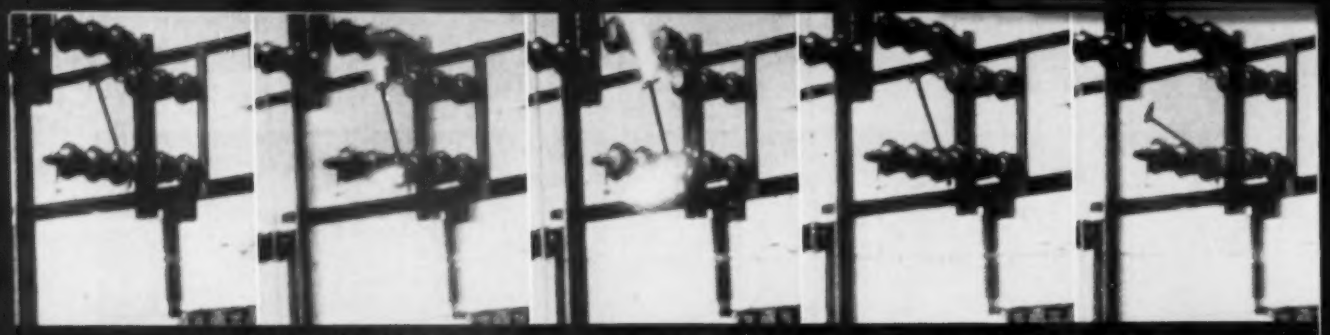
Mr. Carter isn't alone in his opinions of Day-Brite. Thousands of contractors throughout the country feel the same way. That's why Day-Brite is the top choice when quality and net profit are considered.

Certified Lighting for a Better America

DAY-BRITE LIGHTING, INC.
5412 Bulwer Avenue, St. Louis, Missouri

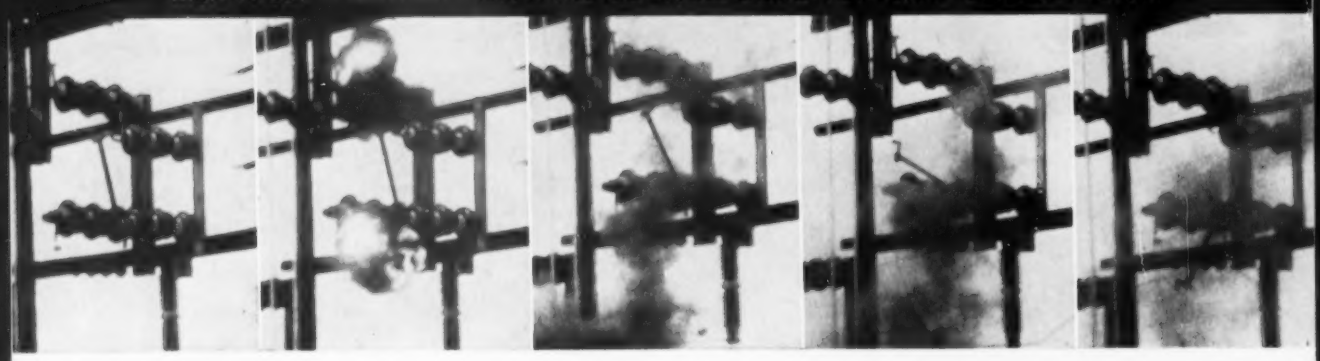
71140

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING FIXTURES

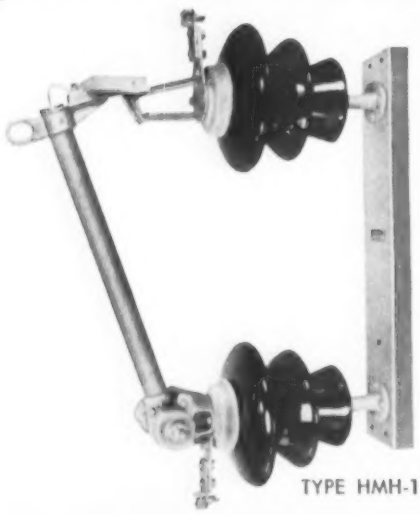


LOW FAULT OPERATION This series of photos shows the Southern States HMH-1 Power Fuse clearing a fault of 288 RMS amperes. MELTING TIME: 4½ cycles—ARCING TIME: ½ cycle.

HIGH FAULT OPERATION This series of photos shows the Southern States HMH-1 Power Fuse clearing a fault of 7120 RMS amperes. MELTING TIME: 3 cycles—ARCING TIME: ½ cycle.



ACTION PHOTOS of Southern States power fuses show full-range capabilities



TYPE HMH-1

EXTENSIVE TESTS were recently conducted in cooperation with a private power company to determine the operating capabilities of Southern States' double-vented power fuses.

More than 75 individual tests were made with faults ranging in values from those just high enough to melt the fuse link to those exceeding 1-million kva. Exhaustive examinations were made of both the B Series and HMH-1 fuses in ratings from 69 kv through 138 kv.

The tests demonstrated that these expulsion type, double-vented power fuses are dependable throughout the range of their ratings. Conclusions drawn from the results of these tests indicate that the interrupting ratings assigned to the HMH-1 and B Series fuses are extremely conservative.

With the many savings and advantages, including low initial cost and re-fusing costs, it will pay you to specify Southern States Power Fuses for your system.

Complete information available in Bulletins 55B and 55HMH-1.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

with National Electric Xduct Junior, E.M.T.

Only high ductile steel is used in the manufacture of Xduct Junior, E.M.T. The result—you can make bends easily without using excessive pressure. In addition, you'll find that properly handled, Xduct Junior does not flatten and the tight finish will not flake or crack. Good bending is just one Xduct Junior feature. You also get—

Easy Fishing—Xduct Junior has a baked-on inside coating of aluminum enamel that holds friction between conduit walls and wires to a minimum.

Corrosion Protection—National Electric's revolutionary process of electrogalvanizing deposits pure zinc uniformly over the entire outside surface of the E.M.T. . . . assures high resistance to corrosion.

If you're looking for fast installation and complete wiring protection, try National Electric Xduct Junior on your next job.

A screwdriver is all you need with National Electric E.M.T. Fittings

The outstanding holding action of these fittings is obtained when the patented embedding screw is driven home in the tubing wall. Actual tests prove the connection is a vibration-proof bond that won't break or loosen unless the screw is purposely released.

Patent No. 2,455,180

For Dependable Pathways of Power

National Electric Products

PITTSBURGH, PA.

2 Plants • 11 Warehouses • 35 Sales Offices

New! Alcoa

RANGE OF CONDUCTOR FOR EACH GROOVE SIZE

Groove Size	Dia. Range Min.	Dia. Range Max.	ACSR Min.	ACSR Max.	Stranded Conductor Min.	Stranded Conductor Max.
1	.292	.502	2 (6/1)	3/0 (6/1)	2	3/0
2	.464	.743	3/0 (6/1)	397.5MCM (18/1)	3/0	400MCM
3	.743	1.060	397.5MCM (18/1)	715.5MCM (26/7)	450MCM	800MCM

(See captions under clamps)

Catalog 581.1
(top, groove #1)
(bottom, groove #1)

Catalog 582.1
(bottom, groove #2)
(top, groove #1)

heavy-duty, universal, parallel groove clamp

Six new Alcoa clamps handle connections on #2 to 715.5MCM conductors

These new heavy-duty U-bolt clamps reduce inventories to a new low. They cover the full range from #2 to 715.5MCM ACSR . . . also handle #2 to 800 stranded. The new development is based on a new universal groove design in the spacer.

These new clamps have had months of extensive laboratory testing. They have undergone 1000 heat cycles using various conductor combinations. Test current used produced conductor temperatures of 200° F. There was no significant change in connection resistance. They are proven clamps.

Generous dimensions mean added strength and reliability. All proportions—length of clamps, number of bolts, bolt sizes—are engineered for the range of conductor size accommodated and the job to be done. Alcoa® U-bolt clamps have given proven service for over 25 years. The experience gained during this quarter century has been applied in designing these new heavy-duty, universal, parallel groove clamps.

Both clamp and bolts are made of aluminum for equalized expansion and improved clamping pressure. U-bolts provide wrap-around strength and are flattened to reduce bulk and distribute pressure. Bolts and nuts are hard-surfaced with an Alumilite® finish and dipped in No-Ox-Id. This hard finish and lubrication reduce thread friction, provides greater clamping force and corrosion resistance.

Your Alcoa representative has samples of these clamps and full details. Let him show you how they can reduce your inventory, help on your connecting problems. Or write Aluminum Company of America, 2308-D Alcoa Bldg., Pittsburgh 19, Pa.

THE ALCOA HOUR—
Television's Finest Live Drama—Alternate Sunday Evenings

ALCOA ALUMINUM
CONDUCTORS AND ACCESSORIES
ALUMINUM COMPANY OF AMERICA
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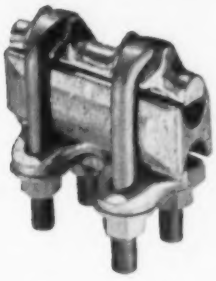
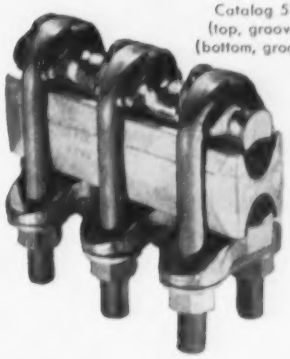
Your Guide to the Best in Aluminum Value



Catalog 582.2 *
(top, groove #2)
(bottom, groove #2)

Catalog 583.1
(bottom, groove #3)
(top, groove #1)

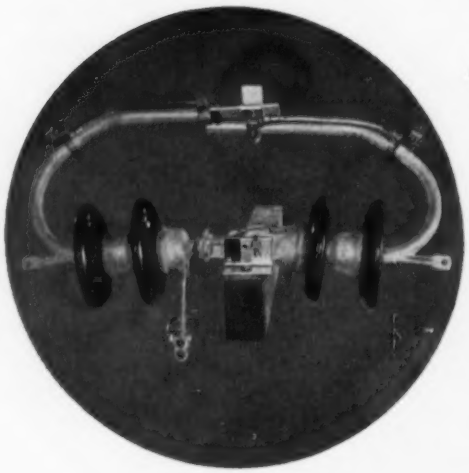
Catalog 583.2
(bottom, groove #3)
(top, groove #2)



Catalog 583.3
(top, groove #3)
(bottom, groove #3)

Functional cataleg numbers: digit to left of decimal is number of bottom groove, digit to right is top groove.

You can install KPF switches more quickly, at less cost, than any comparable switch. Just bore six holes in a single cross arm, mount, and connect. No precision requirements, no temperamental mechanism to bind, freeze, malfunction or need lubrication. Just simple, cleanly designed parts, arranged in a rugged, foolproof manner for trouble-free operation. The economy and dependability of KPF switches has been proved on major utility systems for almost 50 years.



install in the air — or on the ground

Mount phase units individually to pre-installed cross arm on the pole top.

Assemble complete switch on the cross arm before arm is installed on pole.

Mount switch and cross arm on pole, then tilt pole into position.

Details in complete catalog. Why not order test installation?

KPF ELECTRIC COMPANY
Dept. W, 1624 E. Alpine Avenue
Stockton 5, California

KPF
AIR BREAK SWITCHES
Standard for nearly half a century

"Time Teaches Many Lessons"*

*Aeschylus 540 B. C.

Ferdinand de Lesseps:

de Lesseps vision, the Panama Canal, inspired American engineers to titanic efforts—making the idea a reality. Tropical climate and terrain took a heavy toll in men and materials. But the lessons learned by a generation of canal builders—from 1882 to 1914—have never been forgotten.

In 1908, fifty miles of Kerite cable helped speed the completion of de Lesseps tremendous venture. Laid over jungle swamps and scarps, a thirty-mile length of this cable was submerged in the Gatun Lake. Based on the unfailing operation of the first cable, a second Kerite installation was completed in 1918. Time—more than 100 years of it—has taught successive generations of Kerite engineers that there can be no compromise with quality or integrity.

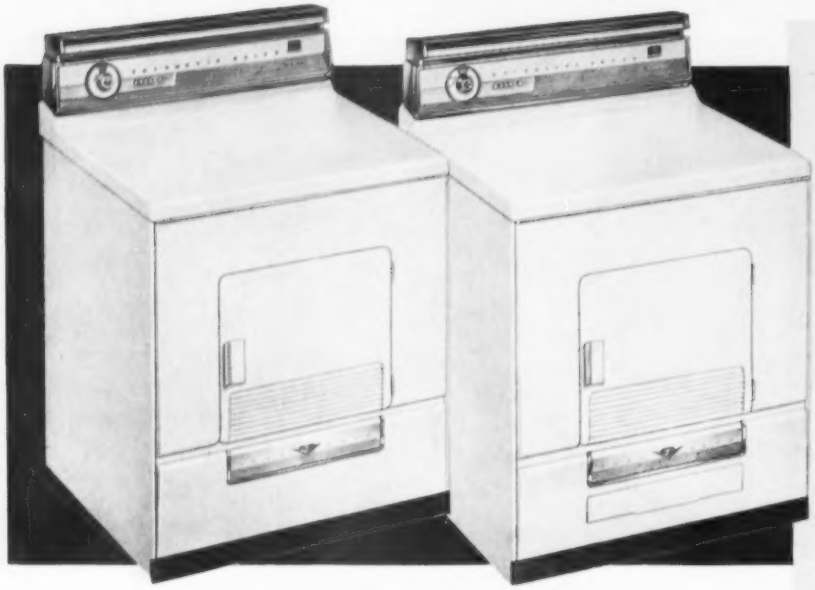
The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

Founded 1854

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco; 3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston; 4101 San Jacinto, Houston 4, Texas; 1010 Euclid Avenue, Cleveland 17, Ohio; 29 West Lancaster Avenue, Ardmore, Pa.

Important to Utility Revenue!
there's a Hotpoint
Automatic Dryer To Fit Every Demand



Because automatic clothes dryers use an average of over 750 Kilowatt hours annually—*almost entirely concentrated in off-peak hours*—the clothes dryer load is becoming more and more important to utilities.

Here's the line of clothes dryers that helps you build this profitable load by surrounding every prospect with more reasons to buy. Hotpoint offers *two* types of Automatic Electric Clothes Dryers, in *seven* great new models.

There are three Sealed Chamber models that need no venting, and four Air-Blower Models with giant lint screen. A model for every need, every budget . . . and each is loaded with Hotpoint's famous pre-sold quality and convenience features that help you sell with a minimum of effort.

Your Hotpoint Distributor has the complete story on the widespread merchandising, acceptance and feature versatility of Hotpoint Automatic Dryers. Why not see him *today?*

Two Types—Seven Models

Hotpoint

Sealed Chamber Dryers
Three Models

No venting required! Ideal for installation in either utility room or kitchen. Purified, heated dry air takes moisture and lint from clothes. Cold water spray condenses moisture, and lint and water are pumped down the drain.

Hotpoint

Air-Blower Dryers
Four Models

Plug-in flexibility! One connection for either 115V or 230V operation. Hotpoint quality and convenience features, in a low price Air-Blower Dryer. Air-Blower models have giant Wide-Screen Lint Filter for increased drying efficiency.

Hotpoint Automatic Electric Dryers put more *salespower* behind "HOUSEPOWER"—more *living* in "LIVE BETTER . . . Electrically"!

LIVE BETTER ELECTRICALLY

Again, Hotpoint *looks at Tomorrow, Today!*

CLOTHES DRYERS • AUTOMATIC WASHERS • RANGES • REFRIGERATORS • DISHWASHERS • DISPOSALL® • WATER HEATERS • FOOD FREEZERS • AIR CONDITIONERS • CUSTOMLINE • TELEVISION

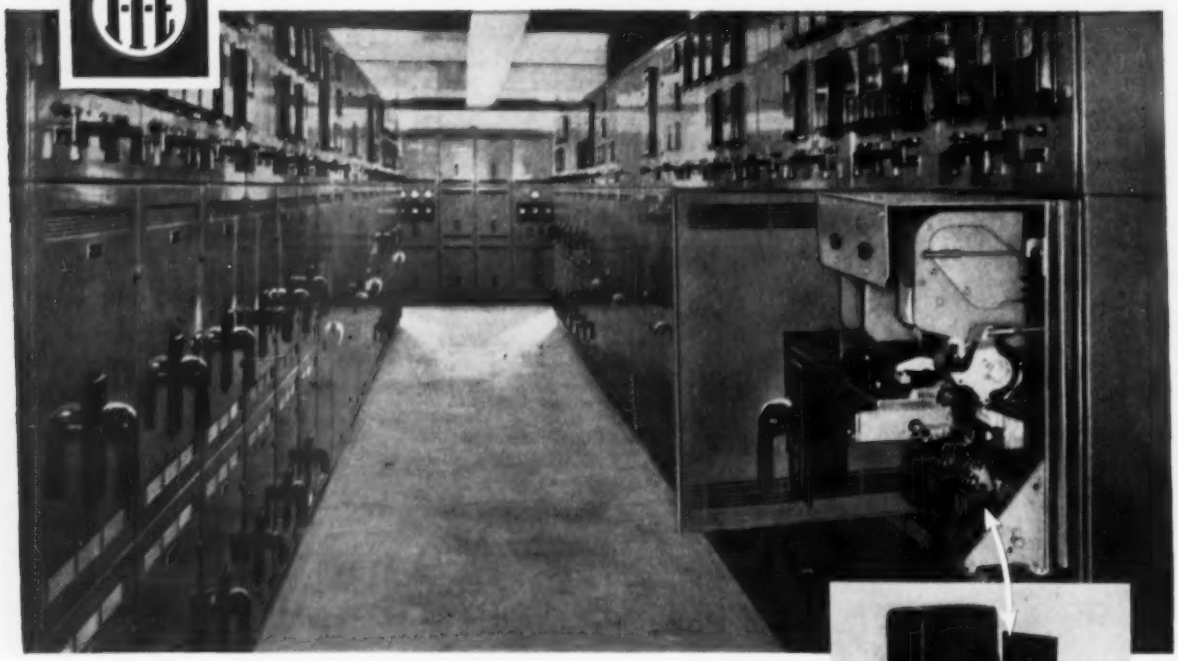
HOTPOINT CO., A Division of General Electric Company, 5600 West Taylor Street, Chicago 44, Illinois

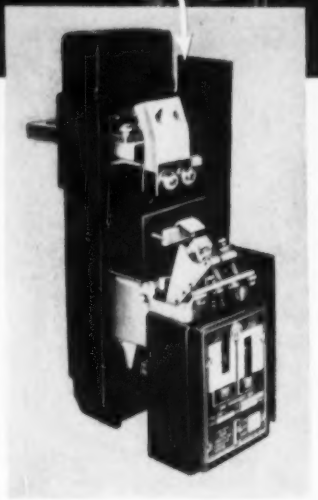
Here is versatile, shielded, single-lamp lighting for more applications than there's space to name with the Sunbeam P2801 Visionaire for corridors, library stacks, small parts bins, stairways, dressing rooms, over murals, paintings and commercial display areas or, as pictured, to form the general lighting system for smart contemporary interiors. Arrange patterns with the matching corner connector for uninterrupted geometric designs; follow contours or mount vertically on walls to provide local illumination. White plastic diffuser presents uniform surface brightness in all directions, snaps in or out with gentle "squeezing" motion. Low, low maintenance and tailored illumination distinction is assured whatever the application. Available in all standard lamp lengths.

SUNBEAM LIGHTING COMPANY

777 East 14th Place, Los Angeles 21, California

LOW VOLTAGE SWITCHGEAR





Here's SENSITIVE Circuit Protection

Some temporary overcurrents are tolerable; should even be permitted to occur. But sensitive circuit protection is needed to interrupt them when they persist too long or are of too high a magnitude.

The I-T-E Type OD-1 dual magnetic overcurrent trip device gives such protection. It permits temporary overcurrents, but limits them in duration and magnitude. This device will trip the circuit breaker after a predetermined interval on relatively low overcurrents or will trip instantaneously on high-magnitude fault currents. In either case you get safe, positive protection—sensitive to the needs of the circuit and the equipment on it.

For complete information on sensitive circuit protection, including selective tripping, undervoltage and other tripping devices, contact your local I-T-E sales representative. Or write for Bulletin 6004B. I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

Features of the I-T-E Type OD-1 Trip Device

PRECISION BUILT and factory calibrated to provide the highest possible accuracy in operation.

SEALED SILICONE TIMING ELEMENT. No maintenance. No oil to handle, no level to maintain, no sludging.

QUIET. Resonant vibration dampeners prevent a-c noise and wear on parts.

COMPLETELY ADJUSTABLE IN SERVICE. The delay pickup is easily adjusted from 80 to 160% of the continuous current rating. The instantaneous pickup is adjustable from 500 to 1500% of the continuous current rating. The time delay is adjustable to any of three time delay bands—minimum, intermediate and maximum.

SAFE DEAD FRONT DESIGN. Insulated knobs permit safe adjustment on a *hot* circuit breaker.

DEPENDABLE impact tripping action. The *hammer blow* movement of the time delay armature at end of timing stroke gives positive operation.

FAST RESETTING. Sensitive check valve on the piston provides quick resetting of the time delay. Repeat tripping is assured.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

IN CANADA: EASTERN POWER DEVICES, LTD.

ELECTRICAL WEST Contractors' News Letter

QUICK NEWS ON TRENDS, LAWS, CODES, MATERIALS, EQUIPMENT, COSTS, WAGES, ETC.

Both were dampened

Both weather and wampum were holding back building, especially in the residential class, during the past month. Tight money had reduced new home starts even in British Columbia. Utah home builders predicted a drop of from 10 to 50% in 1957. F. W. Dodge Corp., in its first 48-state compilation, showed a national increase of 1% in dollars over January of last year, but a decline of 9% in dwelling units. Dodge figures for total construction showed a 13% dollar increase over January, with the 11 western states' total more buoyant than the nation, with residential dwelling units only 7% less than the total.

Don't take long shots

"Although there is no cause for alarm," the Santa Clara-San-Benito chapter NECA "Outlet Box" warns, "there is good reason for caution. In the immediate past there have been some operations which indicate that some contractors have taken the option of a small margin above cost on the premise that a great enough volume would insure them of a profit on their operation. This no longer can be assumed. There is an indication that now is the time to be more selective in the type and volume of work which is bid."

3-District program

Three highly important—and somewhat controversial—topics will be ample reward to any contractor who attends the 3-district joint meeting of National Electrical Contractors Assn. at Portland, May 20-22, aside from the program of trips and entertainment planned. These are: What the proposed Federal Construction Act will do for the contractor; Are Joint Industry boards desirable? and What are the Hidden Hazards of Contracting, the fine print booby traps? Line Constructors will have a whole half day session of their own. Many other tips on trends and markets, labor and business problems are on the agenda that Wes Grasle, host vice-president, will soon announce in detail. Better plan for Portland!

Laws on assembly line

Legislative mills hadn't stopped at press time, so formal action in several western states on legislation had not been learned. In Utah SB63 to license electrical contractors and workers and permit electrical inspection under recognized codes had been passed by the senate and seemed likely of passage by the house and approval by the governor . . . California's welter of bills was far from settling down. Of more than 7,000 bills, the Construction Industry Legislative Council, including representation from NECA chapters, was watching about 18 that would affect subcontractors and the state contractors licensing law . . . In Arizona, a code committee of the electrical joint industrial board, working with the building officials' conference, introduced a bill to permit county planning and zoning. Any county adopting zoning could then adopt a building or electrical code by reference and enforcement power would be given the county to set up inspection. The bill has the support of general electrical, plumbing and refrigeration contractors' associations, the utilities and inspectors . . . In Washington the legislature adjourned without acting on a new electrical law submitted to replace the present one.

Fear the precedent

Objection to the Federal Construction Contract Procedures Act before U. S. Congress has been voiced by the directors of Northern California Chapter NECA in that the bill endorses an idea contrary to California's segregated bidding laws and might influence state legislative changes. The new bill sponsored by NECA and the Council of Mechanical Specialty Contracting Industries recognizes the "single contract system of procurement" as "in the best interest of the federal government". Electrical contractors in California have long maintained that segregated electrical bids are the surest protection against bid shopping by general contractors. The chapter also is "dissatisfied with the five-day clause" in the new bill that would allow substitution of subcontractors.

One that slipped

Breakdown of the segregated bid procedure in California when the $3 million Los Angeles state college science building was submitted on a lump-sum basis, was strongly protested to the state architect's office by subcontractor representatives. The Division of Architecture gave assurance that it would not happen again and promised to call for a rebid on a segregated basis if the lump-sum bid is in excess of the Division's own estimate.

Takes to court

An Oakland electrical contractor is suing IBEW local 595 and its business manager and assistant for over $100,000 damages, claiming they restrained him from going into the electrical contracting business and also threatened him.

Acquires West plant

Vancouver Lighting Co., Ltd. has been purchased and affiliated with Curtis Lighting of Canada, Ltd., Toronto. John A. Wright, president of Curtis, visited Vancouver to plan future developments with F. D. Bolton, Vancouver sales representative in charge of merchandising operations of the Western plant.

New home

Local #6 IBEW moved into its handsome new office building at 55 Fillmore Street, San Francisco, March 11 and held open house for the electrical industry to inspect the new facilities. Charles Foehn, business manager, declared the new building would provide facilities much needed for the largely-increased membership and activities of the local.

Appointees for year

Western committeemen on the National Electrical Contractors Assn. standing committees announced by President Oliver Burnett, include: Clyde L. Chamblin, San Francisco, on the president's advisory council; J. D. O'Connor, Sacramento, on the council on industrial relations; John N. Corbin, Phoenix, George B. Schetke, Portland, Harry Dewey, Twin Falls, Charles A. Wikle, Los Angeles, on the line construction committee; Al Berg, Los Angeles, C. H. Simpson, Cheyenne, and Schetke, on the business development committee; S. I. Jaggar, Portland, Claude Detweiler, Twin Falls, J. D. O'Connor, Sacramento, on the governmental affairs committee; W. P. Robbins, Salt Lake City, Earl Peak, San Francisco on the research committee; S. S. Adams, Portland, the apprenticeship training committee; Sidney F. Hill, Los Angeles, Bert Stiles, Denver, and Gordon Smith, Spokane, on code making panels; and W. R. Grasle, Portland, R. Goold, Stockton, and R. E. Johnson, Denver, on the national employees' benefit board.

On NISA program

Westerners on the program for the 24th convention of National Industrial Service Assn. in Buffalo, May 12 to 15, will be George Larsen of Larsen-Hogue Electric Co., Los Angeles, who will discuss transformers; his partner, Wm. M. Hogue, past president, who will lead the Monday and Tuesday meetings; and Carl Lundberg of Cascade Machinery Co., Seattle, who will be a panelist on the Tuesday afternoon session.

One in a million

With the passing of W. A. (Bill) Hopper, Gem State Electric Co., Boise, on February 3, Idaho lost its dean of the electrical associations of the state. Active throughout his life in electrical contractor and inspector associations and spokesman for them through many of the state's legislative sessions, Hopper's leadership can never be replaced but his constructive influence for industry betterment will carry on through the many friends whom he had inspired to work on organization activities.

About people

Among people, had you heard? - R. Beaumont, Beaumont Electric & Radio, Vancouver, B. C., was named by the Vancouver Electric Assn., and L. Sewell, Ricketts-Sewell Electric, Ltd., by the Associated Electrical Contractors of B. C., for examiners for electrical contractors on the provincial government board . . . Leo Hansen of Westinghouse lamp division, has been transferred from Salt Lake City to the Emeryville office of the company. He was vice president of IEA . . . Oliver I. Lewis, who in 1945 was Pacific Coast sales manager and in 1950 conduit sales manager for Rome Cable Corp., was recently elected chairman of the rigid conduit and electric metal tubing section of NEMA.

Leaves NECA

Anaconda Wire & Cable Co. appointed P. Howard Farley, for the last three years sales promotion manager of NECA, as its manager of contractor sales. He had previously been with Westinghouse in Dallas and Pittsburgh.

Only dip

Copper continued to slide downward as the major producers trimmed 2¢ a pound in late February. This was reflected in the price of wire. Interestingly, aluminum dropped also. Meanwhile, nearly all electrical contractors' materials have been making small increases in price.

Sparring

Wage scale negotiations were consuming lots of contractor association officers' time. While nothing had been settled definitely at press time, the San Francisco Bay Area program seemed likely to be accepted in all but two locals.

Moved

Electrical Service League of B. C. moved its office into the new B. C. Electric Co. building at 970 Burrard St., Vancouver, on March 25.

Wind up anew

The motor winding contest conducted annually by the Electric Club of San Diego got off to a good start February 25 under the sponsorship of the club and San Diego city high schools. Wm. Steinberg, supervisor of industrial arts, S. D. city schools, worked with Walter Zitlau, mechanical engineer, San Diego Gas & Electric Co., in the arrangement for the contest among high school electric shop students. The contest is between the high schools and prizes are awarded the winners doing the most workmanlike job, at a special Electric Club luncheon later.

Experience unhappy

Because of some recent fire experiences, the use of acrylic plastic diffusing elements in luminous ceilings may be prohibited by the California State Fire Marshal's office. Not only has this material been found to support combustion, but when burning it produces toxic fumes, also considered to be a hazard to the fire fighting forces.

Water still in need

Electric water systems continue to sell even though housing starts in 1956 were down nearly 18% in the farm markets. With this encouragement, National Water Systems Month in May will aim at the remodeling and modernization of farm homes and likewise later a campaign is planned for the fall with the farm market as its target. Its slogan - "Make farm water pay - Get a modern pump today".

A-W has "arrived"

National magazines are certainly jumping on the wiring bandwagon. "Look" began the parade with its adequate wiring awards, and now "Living for Young Homemakers" and "Better Homes and Gardens" are in the running with contests of their own. At the annual conference of National Adequate Wiring Bureau in Chicago February 21, one of the top awards - that for an electrical appliance dealer promoting adequate wiring - went to Witham's Radio-TV Appliance Co., Bakersfield. Honorable mentions were presented to Los Angeles Dept. of Water and Power, Arizona Public Service Co. and to G E Supply Co., Seattle . . . The winners of a nationwide home building competition sponsored by "Living for Young Homemakers", Portland General Electric Co. and Pacific Gas & Electric Co., San Joaquin division, received awards for Electri-Living homes with certified adequate wiring, heat pump and central vacuum cleaner systems . . . "Better Homes and Gardens" sprang a new contest for contractors at the Chicago conference which begins April 1, closes June 30, and the winner will be announced after September 1. The first prize is $500 and a number of other prizes will be offered for entries describing wiring modernization jobs . . . In the national rural home loadbuilding contest, Sacramento Municipal Utility District won honorable mention, awarded at the NAWB conference.

Modernize

"The Arizona Story" was a six-part summary of the home wiring modernization program in Phoenix presented at the NAWB meeting. E. E. Cannon, Cannon & Watson Electric, Les Waggoner, Arizona Public Service Co., Leo Sherman, Salt River Power District presented the dramatized story.

Books and data

Lighting manufacturers announce: A new course on modern illumination has been prepared by Westinghouse Lamp and Lighting divisions. It is an 18-lesson audio-visual course, a revision of the previous course used extensively in the past . . . The Wakefield Co. has a 1957 condensed catalog featuring luminous ceilings, modular lighting equipment, pendant mounted fixtures and the latest - the Wakefield high-frequency lighting system . . . Sylvania has brought out three booklets - a new homelighting brochure, "Bright Ideas for Bright Living", a "Fluorescent Lighting Guidebook" for commercial and industrial users, and a new "Incandescent Lighting Guidebook" for commercial, industrial and residential lamp users . . . Curtis Lighting, Inc., has commissioned J. L. Stair, consulting lighting engineer and former chief engineer of the company, to prepare a book for the company's 60th anniversary this year . . . EEI-NEMA standards for street and highway lighting have been announced by NEMA.

New lens unit

Leadlight Co. of Oakland has introduced a new "High Lighter" which can be either recessed or surface mounted, equipped with Holophane low brightness "Prismalume" Controlens.

New system

For exposed-tube lighting systems, Lok-Products Co. of Los Angeles has developed what it calls a Lok-Electric suspension system for use under acoustical ceilings, incorporating use of one to four slimline lamps. Ballasts are located in the space above the ceiling. The system is attached to supports installed by acoustical contractors, the electrical contractor making the electrical installation.

Assemble on job

A plug-in telephone mechanism for apartment houses has been developed by Auth Electric Co. Wall boxes and terminal receptacles can be mounted and connected during the rough-in. For the finish, factory wired telephones are plugged into the wall box and a face plate attached.

the O.Z. SHURELUG

has more of the features you want...

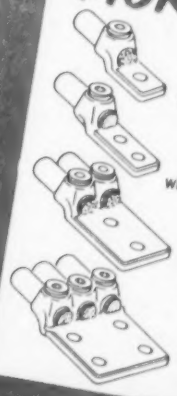
O.Z. means more for you

The O. Z. ShureLug is the newest addition to the complete O. Z. line of electrical fittings; more proof of O. Z.'s policy to make available dependable products at realistic prices.

MORE SIZES

The new O. Z. ShureLug is available for a wide range of sizes, including "in between" sizes usually found only in more expensive makes. This means that whether the job calls for #14 sol. or 1000 MCM cable, there will be an O. Z. ShureLug that will meet your needs more closely, more exactly, for a more secure, more dependable connection.

MORE MODELS



Here's variety too!: O. Z. ShureLug is available in single barrel, double barrel, and triple barrel models . . . with socket heads or hex heads . . . in single hole, double hole, and four hole styles, depending upon sizes selected. Here again, premium selection at practical prices!

MORE ECONOMY

O. Z. ShureLugs are priced no higher than other competitive brands, but you get so much more! Because O. Z. ShureLug is made in more sizes, more models, you buy only the capacity you actually need . . . only the capacity that you'll actually use. Why spend more for over-sized lugs when O. Z. has the size you want, the model you need, at the low economical prices you want to pay?

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

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A MESSAGE TO AMERICAN INDUSTRY • ONE OF A SPECIAL SERIES

Financial Aid to Higher Education

A Fine Start, But...

This editorial has two purposes. The first is to salute American business for the fine start it has made in helping to relieve the financial plight of our colleges and universities. The second purpose is to stress the importance of having business provide more financial aid, and soon.

How Business Helps Higher Education

Business contributions to higher education doubled between 1950 and 1955. They jumped from $40 million to $80 million. Preliminary figures indicate they will be even higher this year.

Business firms have also shown a lot of ingenuity in devising different ways of making their contributions. The methods range from a matching of an employee's contribution to his particular alma mater to wide diffusion of the money through state and regional money-raising associations of colleges and universities. Thanks to this ingenuity, business firms now have a wide choice of ways by which to give effective aid. The way most appreciated by college administrators is the making of gifts unrestricted as to the purpose for which the money is used.

Imposing as it is, however, what business has done thus far is only a good start. Only a tiny fraction of the total number of business firms in the country are giving direct financial help to our colleges and universities; and this fraction includes fewer than half of the hundred largest corporations in the country. Also, the amount of financial help being provided by business constitutes only a very small fraction of what is needed.

Why Colleges Need More Aid

Right now our privately endowed colleges and universities need about $350 million more in operating income a year than they are receiving to enable them to pay decent faculty salaries and be in tolerably good working order otherwise. The reasons, including a severe decline in the purchasing power of their endowment income because of price inflation, have been dealt with in the previous editorials in this series.

In addition, these institutions, together with the tax-supported schools, are faced with a tremendous increase in enrollment over the years ahead. With both a rapidly increasing population of young people and an increasing propor-

tion of them going to college, this year's enrollment of 3.2 million students is expected to reach 4.0 million by 1960, and to be doubled by 1970.

For the next ten years our privately supported colleges and universities must have an average of about $400 million a year above what they can be expected to collect from tuition fees, income from endowment funds, etc.

This figure of $400 million does not include what is needed for new buildings and equipment. It also does not include help for tax-supported schools above what they get from taxes, fees, etc. Business has given and will continue to give these schools substantial aid. Indeed, almost 25% of the financial help from business for our colleges and universities went to tax-supported schools in 1955.

If aid from business met their needs for increased operating income, the privately supported colleges and universities would be given a decisive lift in performing successfully their part in our system of higher education. They would still have large needs of capital equipment — buildings, dormitories, laboratories — but help from other sources, such as that provided by devoted alumni, where they are well organized, could be expected to go far toward meeting these needs. Also some companies prefer to concentrate on meeting needs of this type.

What 1% of Profits Would Do

But do business firms have the capacity to fill the gap in adequate operating income for our privately endowed colleges and universities without putting an excessive financial burden on themselves? Those who have studied this capacity carefully say that the answer clearly is yes. If, of its profits before taxes — this year an estimated $43 billion — business were to devote 1% to helping our privately endowed colleges, it would take care of present operating needs of about $350 million a year. And the balance of $80 million would be a big step in meeting their needs for new buildings and equipment, too.

About one half of a 1% contribution of this sort would, in effect, be made by the federal government. Up to a limit of 5%, contributions of this type are exempt from the federal corporate income tax. For corporations with incomes above $25,000 per year this tax is 52%.

It is clear that not all business firms are in shape to devote 1% of their profits to aid to higher education. Even in this year of record-breaking prosperity, many of them will have no profits at all. But if business generally would take 1% of pre-tax profits as a target or benchmark for financial help to our privately endowed colleges and universities these institutions would again have sturdy financial foundations.

Relatively this is a very small price to pay (1) to insure a continuing supply of competently trained young men and women and (2) to buttress our freedom by assuring the successful survival of the privately supported sector of our system of higher education.

This is one of a series of editorials prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

PRESIDENT

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Municipal Group Says Trinity Is . . .

No Place for Partnership

Six resolutions adopted unanimously by members attending the 25th annual conference of the California Municipal Utilities Assn. include concrete indications of public power views on the state's water and power activities. The conference was held at Palo Alto Feb. 19-22.

The association will ask the legislature to submit a constitutional amendment to voters that is designed to protect both the areas of origin of water resources and the areas of deficiency. The proposal is backed up by a recommendation that the Department of Water Resources must get new State Water Rights Board approval of its assignments of state appropriations. The resolution calls for the Water Rights Board to hold public hearings to determine (1) the boundaries of upper and lower watersheds of a given project; (2) ultimate needs of said watershed and the reservation of water to meet the needs, and (3) the amount of project water available for use elsewhere.

In effect the proposal would place the new Department of Water Resources under the control of the Water Rights Board, though they are separate agencies.

Another resolution adopted urges the legislature to give public agencies preference on water and power from state-owned projects. The same resolution states also:

"That electric power and water developed at projects of the state should be disposed of in such a manner as to encourage the most widespread use thereof at the lowest possible rates to consumers consistent with sound business principles."

On the record, too, is a resolution to work for legislation that would permit municipal utilities to issue revenue bonds to finance system additions and improvements.

Another resolution places the association on record against legislation that would require public agencies to open reservoirs and land for fishing and recreation without the consent of the agency governing body. This would apply if the reservoirs and lands are used in connection with a domestic water supply.

The association resolved that the cost of water and power developed by federal and state projects should be allocated equitably so the sale of water and power will pay for reimbursable costs of the projects.

Reaction to the partnership development of the Trinity division of the Central Valley Project, proposed by Pacific Gas and Electric Co. and endorsed by Secretary of Interior Fred Seaton, is stated in a resolution adopted by the association.

The association resolution urges Congress to: (1) reject the Interior Secretary's recommendation to accept PG and E's offer, and (2) to appropriate sufficient funds for construction of the power plants and transmission facilities authorized for the project.

Alex Radin, general manager of the American Public Power Assn., reported on the background of recent residual fuel oil price increases that led to the present Congressional investigation.

Radin said: "From the various reports we have seen, we can only conclude that the oil companies, in raising the price of fuel oil after the Suez crisis, did not, in (President Eisenhower's) words, 'discharge their responsibilities, and exercise their authority in conformity with the needs of the United States' . . ."

Discussed at the meeting was the impact of digital computers in the electric utility business. Robert E. Rawlins, general manager of Dynac Inc., Palo Alto, illustrated how computers could be built to eliminate meter reading. The machine would sample meters via telephone circuits, compare current consumption with historical records, compute the bill and print it for mailing. He said the computer could even be instructed to enclose one of several "degrees" of delinquent notices. The "degree" would correspond with how much in arrears the customer happened to be.

President Carl Richey, Sacramento, left, with successor, Paul Beerman, San Diego

New officers elected at the conference were: president, Paul Beerman, Water Department, San Diego; and vice-president, R. J. Brusatori, Marin Municipal Water District, San Rafael. Re-elected as treasurer was Glenn A. Baxter, and as secretary, F. V. Fry.

NISA

Rocky Mountain Chapter has been established by the National Industrial Service Assn. as its newest member. While it will receive its charter at the national convention in Buffalo, May 12-15, the 31st chapter began operation on Feb. 22 in Denver. Damon R. Ward, Ward Electric Co., Denver, was elected president, Earl T. Baker, Baker Electric Co., Denver, vice-president; Malcolm Logan, Rocky Mountain Electric Service, Durango, secretary-treasurer. National President Charles J. Covington of Mount Vernon, Ill., attended the organizational meeting together with Fred B. Wipperman and Joseph M. Harrington. Next semiannual meeting will be held in Denver, March 23.

Contractors

Inland Empire Chapter, NECA, Spokane, elected Rod Anderson its president, Gordon Smith vice-president, Paul Briggs treasurer and Les M. Stewart governor.

Kern County Electrical Contractors Assn., at its recent annual election, named Hugh Bartenstein of Bart Electric, Bakersfield, as president succeeding Forrest Chancellor. Robert N. Ward is vice-president, R. B. Butterfield treasurer. John Warren is the secretary-manager of this independent association.

Sacramento Valley Chapter, NECA, installed officers for the year 1957 at a dinner-dance recently. The new officers are E. T. French, son of E. L. French, president; B. L. Slater vice-president; Kenneth Carlson of Grason Electric Co., secretary; and L. C. Wesleder, Adams Electric, Auburn, treasurer. Hugo Becker of Wismer & Becker is governor and the other directors are Bert Naylor, George Foss Co., past president, and Paul Gatejen.

San Diego Chapter, NECA, elected Oscar Lundberg as its new governor and Chuck Bratton president, Robert Davies vice-president and W. L. Larson treasurer. Re-elected were

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one in which the forces of nature are extremely rough on man-made things. Thus, the simple fact that Simplex supplies more submarine cable than all other manufacturers combined speaks volumes as to product quality. Simplex Submarine Cables are specifically engineered for reliable underwater communication and power transmission. Their many varieties of outer coverings, wire armor, heavy jackets of Neoprene and other materials, guard against underwater hazards and assure long, dependable service.

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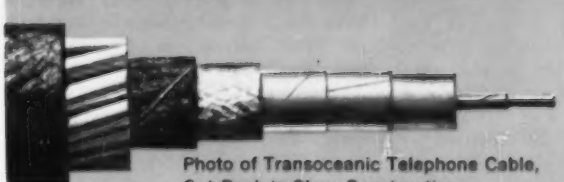

Photo of Transoceanic Telephone Cable, Cut Back to Show Construction

LIVE BETTER ELECTRICALLY

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Directors Norman Ferguson and Al Eddy. Manager is Shelby Wiggins.

Electrical Contractors Division of the Home Appliances of San Diego County launched its 1957 program Feb. 18 at a dinner at Mission Valley Inn under Chairman Neville Baker. Baker outlined the over-all promotion objectives of the organization and announced committee appointees. In charge of the advertising committee is Ralph Rohrbach; exhibits, Tom Murphy; membership, V. R. Knight; program, E. C. Phillips and Joe Burkhart; residential, Bub Delano; commercial-industrial, Bob Redfield; lighting section, Vern Larson; power section, Fred Byrum; and codes and standards committee, Bill Powell and Chuck Bratton. Besides sponsoring the exhibits in the Spring Fair, April 23-28, for the contractors' building, the power committee plans an electrical construction show in October. The lighting committee plans another certified lighting course starting April 16. The residential committee is working for adoption of 100-amp minimum service requirements in all the municipalities of the region.

EMEA

Electrical Maintenance Engineers Assn. of the Columbia Basin heard F. B. Hyland, consulting and application engineer, Westinghouse, present the theory and application of "Industrial Magamp Systems" for regulating static in the paper, lumber and steel industries at its Feb. 28 meeting. Previous meeting heard discussion of electronics in industry by J. D. Stevenson of Industrial Components Inc. Meetings are held in the Portland General Electric service center, Portland.

EMEA of Southern California has announced an impressive roster of speakers and discussion leaders for its electrical maintenance conference at the University of Southern California April 16-18. Paul H. Heinrichs, Southern California Edison, is conference chairman. A conference banquet at Rodger Young Auditorium will feature an outstanding authority in electronics. There will be field trips through Beckman Instruments at Fullerton and General Petroleum building, Los Angeles. Open discussions and panel forums will be presented on "Planned Preventive Maintenance," "Maintenance of Electronic Equipment," "Maintenance of Electrical Equipment in Industry," "Electrical and Safety Codes," "Industrial Plant Lighting," "Maintenance of Electrical Equipment in Small Plants" and "Load and Power Factor Analysis." On the roster are Frank Miller, Grayson Controls Division, Robertshaw-Fulton, Kenneth Shaw, Westinghouse, Frank Tharp, Floodlight & Fluorescent Maintenance, Curtis Stump, Mullenbach Division of Electric Machinery Mfg. Co., Dan Trott, Cunningham & Sons, Thomas Regas, BullDog, William King, Electric Machinery Mfg. Co., Howard Hellman, professor, University of Southern California, King Christopher, Clark Controller, Ed Lanski, I-T-E Circuit Breaker.

The officers appointed by the executive committee were installed Feb. 20. President is Charles H. Hays, Electrical Estimators; first vice-president, Harry D. Huff, American Pipe & Construction Co.; second vice-president, Henry R. Schumacher, Richfield Oil Corp.; secretary-treasurer, Robert J. Kernaghan, Goodyear Tire & Rubber Co. Executive committee members named for the next three years, named at the Jan. 16 meeting, were Paul Henrichs, Southern California Edison, Charles M. Tabor, Larsen-Hogue Electric Co., and Frank R. Tharp, Floodlight & Fluorescent Maintenance Co.

Heading the Peninsula Electrical Contractors Assn. are these long-time workers in association affairs: Louis Rolla, Coast Electric Co., Redwood City, treasurer; Everett Marshall, Marshall Electric, San Carlos, president; and William Kennedy, Kennedy Electric, vice-president, Daly City

Leagues

Electrical Service League of British Columbia will establish 10 more chapters to carry on promotional work in every part of British Columbia in 1957, it was announced. New chapters will be formed in Prince George, Kamloops, Williams Lake, Mission City, Chilliwack, Nanaimo, Duncan, Penticton, Trail and Nelson. H. G. Horsman, president, said the league plans to continue its Red Seal and Gold Seal "Housepower" and "Farmpower" programs, sponsor National Electrical Week, exhibitions, carry on field services, contact home owners, builders and architects. In 1956, 128 Gold Seal certificates were granted, full 100-amp service was installed in 4,439 houses for Red Seal certification and 630 Red Seal wiring plans were prepared for house builders and owners. A total of 8,792 outlets were added in existing houses. General contractors will be included in this year's league program.

Snake River Valley Electrical Assn. dates for three home shows in the territory of the association were tentatively set in June for Pocatello the first week, Twin Falls the second and Boise the third week in June. This would allow exhibitors to move their exhibits from one to the other in a close succession for more complete coverage of the Snake River Valley. Recent meetings of the three chapters likewise determined that December was not the best time to hold the annual meeting and it will probably be held after the first of next year instead. A definite date had not been decided.

Mid-Columbia Electrical League is the newest organization to join the family of leagues throughout the country. It was organized by 20 electrical firms and organizations in Pasco, Kennewick, Richland, Benton City, Yakima and Ritzville, Wash., Feb. 14. Jack Criswell is acting secretary. Three PUDs are members of the organization, the Benton County PUD at Kennewick, Franklin County PUD at Pasco, Big Bend Electric Cooperative at Ritzville. Membership in the league is from all groups in the industry, including appliance, radio and television dealers, service, electrical contractors, manufacturers, distributors, IBEW, utilities and trade allies.

Electric League of Los Angeles had its annual banquet meeting in Hollywood and elected Edward G. Marten, Westinghouse Electric Supply Co. consumer services manager, as its president; Stanley Everett, TV and radio dealer in Alhambra, executive vice-president; Floyd Lovelace, Los Angeles Department of Water & Power, secretary; and Robert H. Thompson, Packard-Bell, treasurer. The executive committee adds Frank Ballman, Norris-Thermador; John B. Chadwell of Hoffman; Ray W. King, King's Appliance Center; Robert Leonard Jr., Leonards International; Clifford V. Swanson; Harold G. Pemberton, Ap-

pliance Wholesale Supply; Robert D. Williams of Brand Appliances; and Glen L. Logan, managing director of the Electric League. Membership in the league now represents 430 firms.

Bid Depository

Greatly improved service in the East Bay region of San Francisco was acclaimed by members of the nonprofit corporation, the Electrical Industry Bid Depository of San Francisco Inc., at its annual dinner and election of officers Feb. 13, presided over by Fay Lemoge, its vice-president. William Nagel, president, was out of town. Since the establishment of an Oakland office with John McManus, assistant custodian, in charge the members paid a tribute to Arthur Rowe, custodian, and his assistant and pointed to the increased membership from 155 to 174 as proof of growth. Directors elected for 1957 were Fay Lemoge, Mervin Meyer, Pacific Electrical & Mechanical, William Mohrdick, Mohrdick Electric, and William Power, Crown Electric, for San Francisco Hal Sloat, J. W. Barnes of VG Electric, Richmond, H. A. Bowen, Clifford Electric, W. Nagel, A. Neri Electric, and E. L. Farris, Accurate Electric, San Leandro, as East Bay members.

Inspectors

L. Handy, provincial inspector of electrical energy, was elected president of the Electrical Inspectors' Assn. of B. C. at its annual meeting at Burnaby, B. C., last month. He succeeds J. Harrison. J. R. Low is vice-president, J. R. Walker, senior electrical designer, provincial electrical energy department, was re-elected treasurer and J. R. Dooley, Electrical Service League of B. C., continues as secretary. After a tour of electrical equipment at Vancouver General Hospital, panel discussions were held on electronic and built-in ovens, table-top ranges and electric heating regulatory devices. T. I. Ingledow, B. C. Electric Co. chief engineer and vice-president, told of the province's power potential and prospects for development. Highlight of the conference was a discussion on grounding given by Fred Kempton, provincial inspector of electrical energy.

Nevada Chapter of IAEI has set the dates of April 26-27 for its annual meeting at Las Vegas, Nev., at the Fremont Hotel. This corrects a previous announcement of an earlier meeting.

Repeaters—Creighton Schwan, Alameda County electrical inspector, who last year as vice-chairman filled out the term of Pat O'Leary, Berkeley, who resigned, was elected to a year of his own as chairman of the Northern California Chapter, IAEI. Seated at left is Ken Bliss, Pacific Fire Rating Bureau, re-elected secretary-treasurer once more

Arthur Rowe, custodian, demanded strict integrity to make the San Francisco Bay area bid depository above reproach. At the table with him were William Langlais, a director, John McManus, assistant custodian; Fay Lemoge, vice-president, and Garth Chamblin, secretary. It was the depository's annual election dinner

RMEL

Spring conference of the Rocky Mountain Electrical League, April 21-24, at the Shirley-Savoy in Denver, is shaping up with strong programs for each of the committees of the association. There will be parallel sessions of the accounting committee under R. M. Gardner, Southern Colorado Power, Pueblo; adequate wiring committee under Jim Vaneman, G-E Supply, Denver; engineering under J. Y. Parce, Stearns-Roger Mfg. Co., Denver; information under P. J. Kronenberger Jr., Colorado Central Power, Englewood; and sales and promotion section, John R. Dalsant, Public Service of Colorado, Denver.

On April 24 the Rocky Mountain Chapter, Illuminating Engineering Society, holds a one-day conference on outdoor lighting in conjunction with the spring conference.

RMEL's eighth annual Electric Meter Institute, co-sponsored by the University of Denver, was held the week of March 25 at the University's engineering department. Metermen, including REA, were invited to attend from the entire area and adjoining stations. Professor Arlie E. Paige was in charge as previously.

APDA

American Power Dispatchers Assn. national spring meeting will be held in Los Angeles Friday and Saturday, April 26-27, at which time officers for the new year will be elected. W. T. Meline, assistant chief load dispatcher, Los Angeles Department of Water & Power, will be speaker; his subject, "Switching and Operating Procedures." The dinner and business meeting will be held at Cartenter's Santa Anitan restaurant at Arcadia.

IES

Too late for coverage in the March issue, word of the program for the Illuminating Engineering Society fourth intermountain regional conference at Alvarado Hotel, Albuquerque, April 11 and 12, has come. J. D. Whitnell, Arizona Public Service, regional vice-president, will open the meeting and Brooks Chassaing, chairman of the national membership committee, will present the IES progress report. First technical session, Leonard J. Carlon, Rocky Mountain Section, presiding, will have Willard Allphin, Sylvania, discussing "Use and Misuse of Main-

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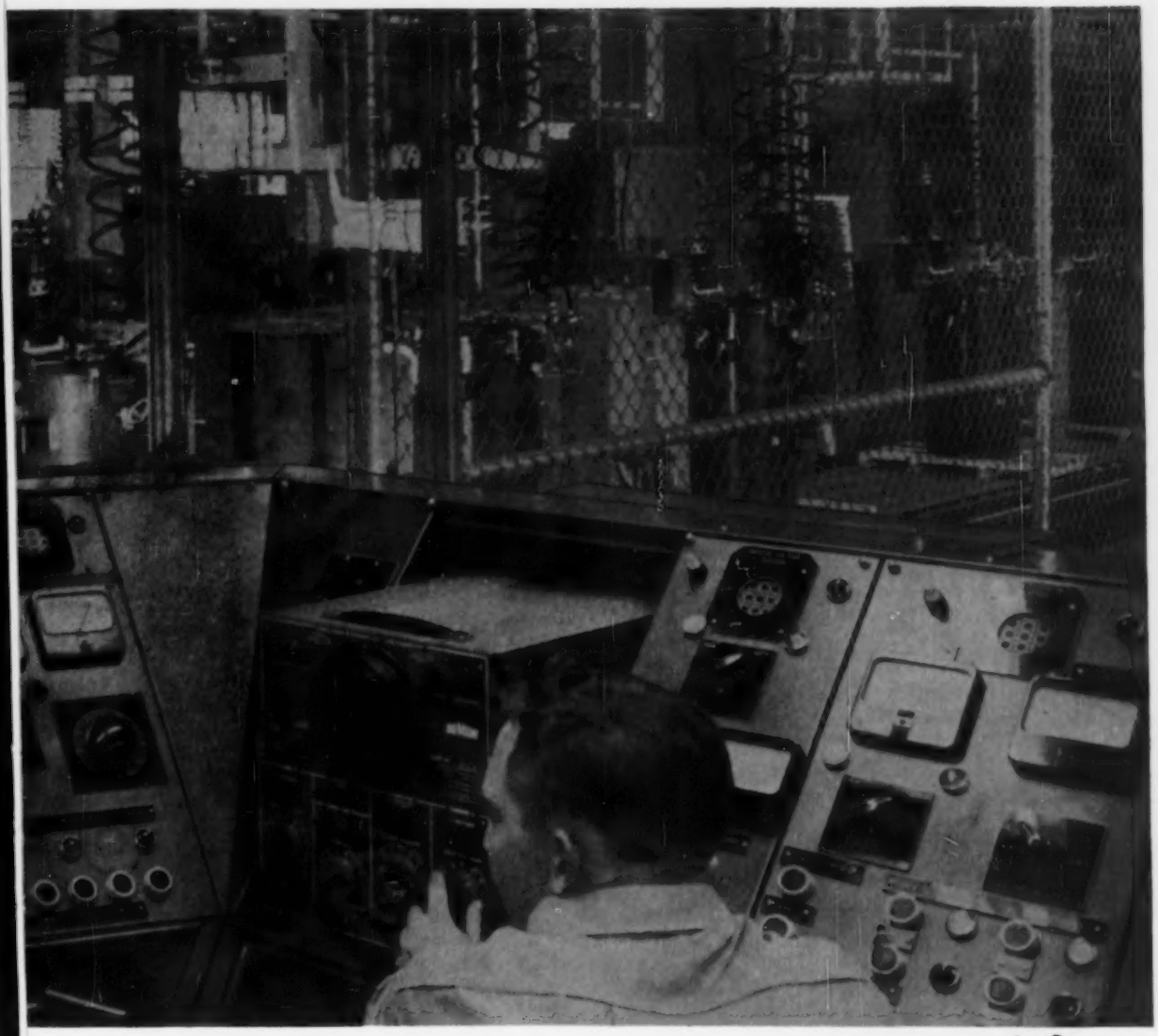

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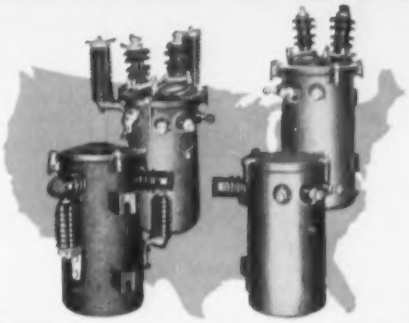

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tenance Factors." F. H. Bridgers will discuss "Lighting and Air Conditioning." President Marshall N. Waterman will address the luncheon.

The afternoon session will begin with the "My Most Interesting Lighting Job" contest, followed by C. J. Allen of Nela Park discussing "Hi-frequency and Hi-foot-candles" and Carl Albach will describe the high-frequency lighting at the University of New Mexico gymnasium, which he engineered. John F. Gohring, Arizona Section, will preside.

Friday's sessions will begin with a talk by J. Hugh McCulloch, "Using Fixture Test Data." William Shalda, Los Angeles, will talk on garden lighting and a panel, "Lighting Design—As I See It," will conclude the morning session. Wayne F. Mulcock, chairman, Utah Section, will preside. The afternoon session under Robert F. Even, chairman, Southern Colorado Chapter, will include a review of IES activities, a talk on "The Dilemma of Quantities," another on stage lighting and one on residential lighting. Fluorescent floodlighting will be the last topic. At the president's reception and banquet, Robert J. Uhl, chairman, New Mexico Chapter, will preside.

NELPA

Sun Valley, Idaho's famous playground, is to be the scene of two important meetings of NELPA this spring. The third of the section meetings will be in scenic Vancouver, B. C.

The first of the meetings, scheduled for the well-known ski resort, is that of the Engineering & Operation Section, jointly with the Personnel & Safety Section and the Purchasing Committee, scheduled for April 24-26. Local arrangements are being handled by J. F. Emery and Glen J. Hall of Idaho Power, Boise. Announcement went out recently directing that hotel reservations be sent direct to the hotel. Delegates will be placed both in the Sun Valley Lodge and the Challenger Inn.

Advance registrations are to be made to C. F. Koska, Idaho Power, Boise.

The engineers' technical program is being arranged under the general direction of J. H. Steede, B. C. Electric, section chairman, with R. P. Mortell, Puget Sound Power & Light, vice-chairman, allotting the times and coordinating the general and parallel sessions of the several committees. W. E. Gordon, Portland General Electric, and J. T. Bradshaw, Puget Sound Power & Light, co-chairmen of the Personnel and

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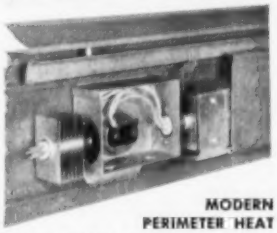
(Illustration of cut-a-way section)



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Safety Section, are designing the program for those groups, and Fred G. Hodge, Portland General Electric, chairman of Purchasing, is setting up his group meeting.

The opening morning general session, following welcome by the Idaho Power Co., is to be chairmanned by Fred Hodge and W. E. Gordon. Speakers on this session include Dr. J. W. Rittenhouse, technical director of High Voltage Equipment Co., Cleveland, on the subject of the shortage of engineers and engineering education, and C. W. (Brodie) Leihy, editor of ELECTRICAL WEST, on "What's Making Our Economy Tick."

Most of the remainder of the three days will be taken up by some parallel sessions of subcommittees of the Engineering Section, and the sessions of the Personnel & Safety and Purchasing group.

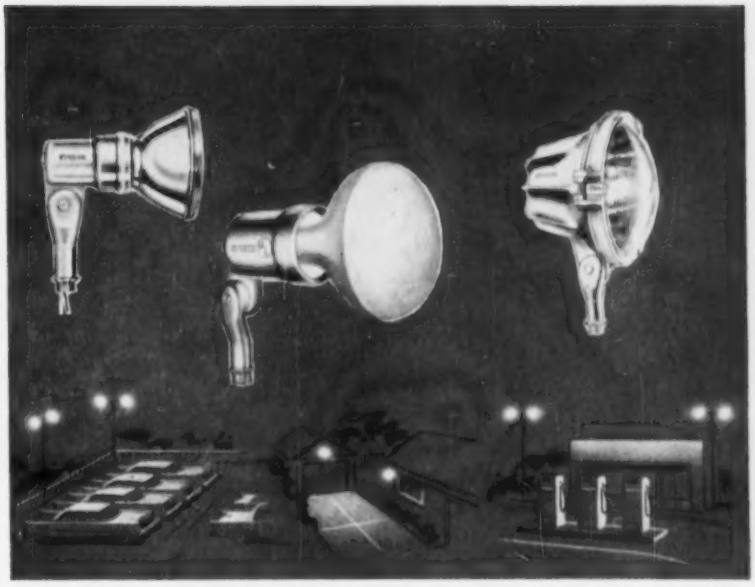
Chairmen of the engineering committees, who are arranging their own committee programs are: utilization, C. S. Alger, Puget Sound Power & Light; transmission and distribution, E. P. Kelley, Puget Sound Power & Light; power production, Glen Hall, Idaho Power; house heating, R. E. Sinclair, Pacific Power & Light; meters, codes and services, Lloyd Janz, Portland General Electric; electronics, J. S. Hooper, Utah Power & Light; and electrical equipment, R. A. Radford, Utah Power & Light.

Entertainment features will include social hours, banquet and other events indigenous to the famous resort area. Henry Falkner, Westinghouse Electric Supply Co., heads the manufacturers and distributors entertainment committee.

Accounting — The other section meeting to be held at the Sun Valley Lodge is that of the Accounting & Business Practice Section scheduled for June 20-22.

Business Development — This section will meet at Vancouver Hotel, Vancouver, B. C., May 6-8, under the chairmanship of A. S. Gilbert, Idaho Power, assisted by Clarence Scheyer, Puget Sound Power & Light, section vice-chairman. Local arrangements are in the hands of A. W. J. (Arch) Smith, B. C. Electric, Victoria, and R. G. Scott of that company, Vancouver, B. C., as co-chairmen.

Meeting with the section as in recent years will be the rate research committee, under J. A. Polson, B. C. Electric Co., and the public relations and advertising committee with Harold J. Merilees of the B. C. company in the chair. Theme of the meeting will be woven around Live Better . . . *Electrically* and Housepower."



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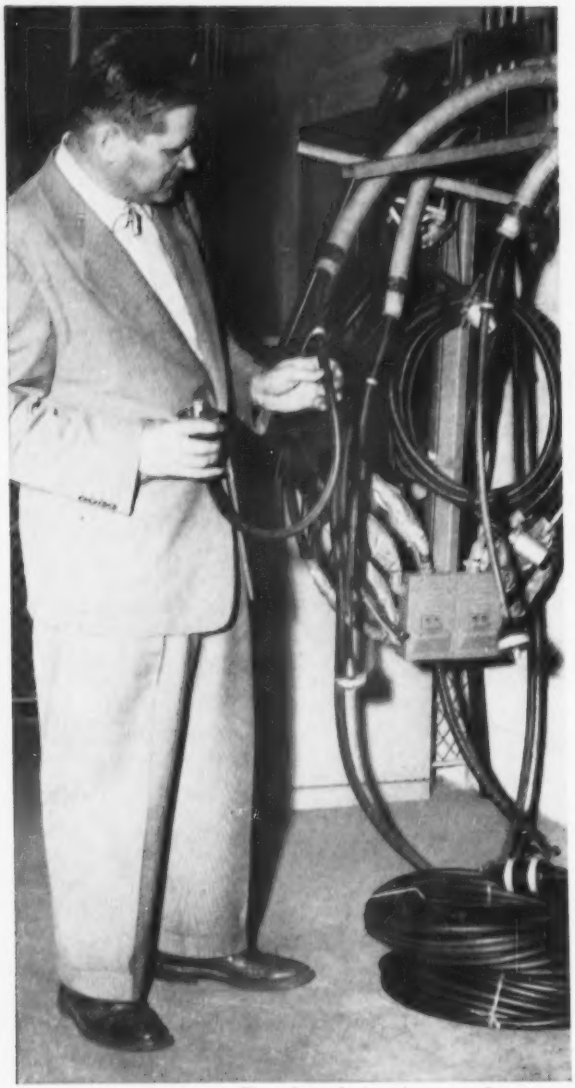

Mr. Maginniss inspects a Tiger Brand pigtail coming from end of a vibrator tool.

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Harry Bunton paints a vibrator. Notice heavy casing around cable near the hand hold.

Here is a cable casing that was damaged in use. Cable inside was not injured.

Workman ready to drop tool into concrete. Electric generator is on ground.

See the snarl of cable between tool and generator. Tiger Brand is made for this treatment.

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THIS MONTH'S NEWS

Two Cofferdams Out At Brownlee Project

Early flooding of the Snake River, swollen by melting snows, took out the two cofferdams at the Idaho Power Co.'s Brownlee Dam project, but their loss was not expected to delay construction appreciably.

Glenn Johnson, resident manager at Brownlee for Morrison-Knudsen Co., said cutting of the cofferdams came earlier than expected but had been anticipated in planning. Normally, the spring runoff in the Snake comes in May or June.

Crews and equipment were shifted to upper spillway and intake excavations at higher levels, Johnson said. That phase of the work is expected to take from three to five months.

Engineers were not caught unprepared by the sudden rise of the river, brought on when warm southerly winds spread over the area melting snow when frozen ground could not absorb runoff. Cofferdams had already been cut close to water level.

Cutting of the cofferdams was started on a Sunday night when it became apparent water was coming up rapidly. The job was finished the next morning.

The earthfill cofferdams will not be closed again until after the spring runoff, Johnson said.

Arrows point to the locations of two cofferdams taken out by flood at Brownlee

Seventeen PUDs Form Washington System

Authorized three weeks earlier by the State of Washington, a joint operating agency of 17 PUDs was organized Feb. 20 at Seattle as the Washington Public Power Supply System.

Grover C. Greimes of Sequim, representing the Clallam County PUD, was elected chairman, with Glenn C. Walkley of the Franklin PUD as vice-chairman; S. A. Sween, Snohomish PUD, secretary; William T. Elmgren, Clark PUD, treasurer; and Harry Swenson, Grays Harbor PUD, auditor.

The system, as organized, is composed entirely of PUDs but also can be joined by municipal power systems. It is the first agency to be authorized under a Washington state law, upheld in the courts, that permits utilities to cooperate in the construction, purchase and operation of generating and transmission facilities.

"This joint operating agency will permit us to build projects which individual PUDs or municipal systems could not undertake," said Greimes.

The system is studying plans for four hydroelectric projects in western Washington and a 200,000-kw steam power plant to be built where it is found most feasible from economic and engineering standpoints. The Washington State Power Commission is seeking authorization from the state legislature to build a similar steam plant, over strong opposition from the PUDs.

New Power Plant Added To Edison Facilities

A new, high-efficiency power plant has been added to Southern California Edison Co.'s electric system with the placing in commercial operation of unit No. 2 at Alamitos steam station, near Long Beach.

The new unit, identical to the first one which went in service last September, has a generating capacity of 175,000 kw. The station's total capacity is now 350,000 kw.

The steam station, located between a drainage channel of Alamitos Bay and the main channel of the San Gabriel River, is designed to utilize natural gas whenever available.

Chelan PUD Buys Back Some Outstanding Bonds

The Chelan County PUD of Wenatchee, Wash., has bought back $1,868,000 of its outstanding Rock Island production system bonds so far this year at a saving of $37,299, according to L. J. Richardson, president of the PUD commission.

The bonds, which would have matured in 2005, were issued in 1951 as part of a $33,600,000 issue to finance completion of the power house and spillway at Rock Island Dam and to install six additional generators. They were purchased with surplus funds in the Reserve & Contingency fund.

The PUD paid an average price of $980.03 for each $1,000 bond, plus accrued interest at 3.5%. Similar bonds currently are selling at more than 4%.

Puget and Ellensburg Exchange Customers

An exchange of customers between Ellensburg, Wash., City Light and the Puget Sound Power & Light Co. has been authorized by the Ellensburg City Council.

Ellensburg will pay $148,075 for Puget Power facilities serving 352 customers within the city. Puget Power will receive municipal facilities serving 25 customers outside the city.

PG and E Seeks Increase To Cover Fuel Oil Hike

Increasing fuel oil costs make a raise in electric rates necessary, Pacific Gas and Electric Co. has told the California Public Utilities Commission.

The application requests an across-the-board increase of 5.94%.

This increase, the second since 1949 and the third in more than 30 years, would recover about $16,600,000 a year in costs caused by higher fuel prices. Fuel costs for generating electricity in 1957 are estimated at $17,400,000 more than a comparable amount of fuel would have cost in 1952 when the Commission last fixed PG and E electric rates.

Also requested by the application is the establishment of an escalator clause designed to keep rates in appropriate relation to fuel costs.

Fuel oil cost $1.80 per barrel in 1952. Since then the company has absorbed six fuel oil price increases without rate relief. The two most recent raises have brought the posted oil price to $2.75 per barrel. PG and E estimates its 1957 consumption of oil for steam-electric generation at 9,700,000 bbl. Most of the steam-electric plants also use natural gas, the price of which has increased because of higher fuel oil costs.

Compared with 1952 prices, PG and E said it anticipates its fuel oil will cost $9,028,000 more in 1957 and its natural gas for steam plants will cost $8,372,000 more.

Bureau's Palisades Dam Begins Producing Power

Hydroelectric power from the Bureau of Reclamation's Palisades project in Idaho went on the line in February as the first of four generators began operation to test circuits with REA cooperatives, private utilities and Idaho Falls municipality, Secretary of the Interior Fred A. Seaton announced.

Commissioner of Reclamation W. A. Dexheimer said he anticipated that contracts will be executed by Regional Director H. J. Nelson with the Fall River Rural Electric Cooperative Inc., the Lower Valley Power & Light Inc., and Lost River Electric Cooperative Inc. These three are REA cooperatives. Contracts have also been executed with the city of Idaho Falls, the Utah Power & Light Co. and the Idaho Power Co.

Approximately 30% of the yearly energy output at Palisades will be firm, all of which is under contract to the REAs and Idaho Falls municipality. Because of the seasonal nature of Palisades generation, resulting from summer irrigation releases, the bulk of the project's power production will be wheeled by the Utah and Idaho power companies to private and federal irrigation developments for pumping.

Palisades Dam, 270 ft high and 2,100 ft long at the crest, is the largest earthfill dam ever constructed by the Bureau of Reclamation.

Office Building Plan Gets SMUD Board Okay

The board of directors of Sacramento Municipal Utility District has approved plans for a new $3,000,000 office building to be located near the utility's operations yard at 59th and R Streets.

Royal Miller, president of the board, said, "The modern office structure would be located on a 14-acre site on the north side of S Street and east of 61st Street and would serve to consolidate all of the district's office staff at one location. Construction is scheduled for this fall.

• Utah Copper Division of Kennecott Copper Corp. announced scheduled construction of a $16,000,000, 75,000-kw steam-electrical addition to its central station at Magna, Utah.

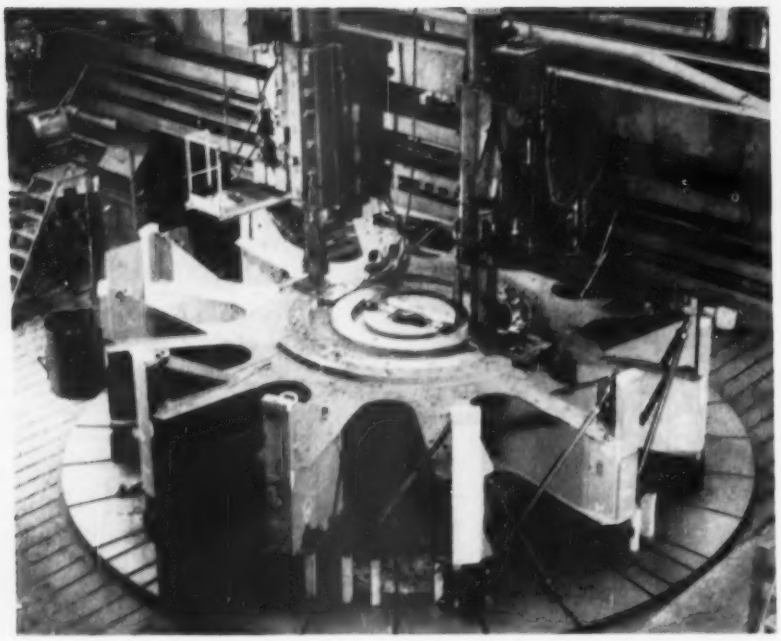
G&T Cooperative Plans Steam Plant Expansion

Colorado-Ute Electric Assn., an REA with headquarters at Nucla, Colo., announced it will build a third generating unit at its Nucla plant. This 12,500-kw unit will bring the plant's capacity to 37,500 kw, largest on Colorado's Western Slope. Colorado-Ute, which recently negotiated a $10,500,000 REA loan, previously announced plans for two generating units at Nucla. Jack Taylor, association manager, said the first two units are scheduled for completion by Oct. 1, 1958. Construction on the first unit will begin in March. The third unit will be cut into the REA lines two months after the first two units are finished, Taylor said.

He reported contracts have been awarded for more than $4,000,000 in electric equipment for the plant and its transmission system.

The Nucla plant will serve four REAs which now have about 11,000 home customers in the oil and uranium area of southwestern Colorado. The co-operatives are the Delta-Montrose Rural Power Lines of Montrose, San Miguel Power Assn. of Nucla, Empire Electric Assn. of Cortez and La Plata Electric Assn. of Durango.

Progress on the main power tunnel at Pacific Power & Light's Swift No. 1 hydroelectric project is shown in this view of current work. The level section of this tunnel reaches 200 ft into the rock and then it turns upward sharply. Plans call for a total of 2,057 linear feet of tunneling. The main tunnel divides into three penstocks that will feed water from the reservoir to the generating units



This rotor, weighing about 40 tons, will be installed in the ninth waterwheel generator of Chief Joseph Dam. Westinghouse Electric Corp. has built or under construction the initial 16 hydroelectric generators to go into the project. Combined capacity of the units is 1,024,000 kw. Diameter of this one is 26 ft

Alcoa Abandons Plans For Alaska Development

Alcoa has abandoned all plans for a $400,000,000 hydroelectric development in southeastern Alaska, according to a disclosure at Juneau, the territorial capitol.

The project, for which preliminary plans had been announced by Alcoa several years ago, would have involved diversion of the head waters of the Yukon River in Canada. The Canadian government has "refused to consider any diversoin of the Yukon headwaters," said Leon E. Hickman, vice-president and general counsel of Alcoa, in a letter to Gov. B. Frank Heintzleman of Alaska.

The project would have generated 1,000,000 kw and included establishment of an aluminum plant.

Tie Kills Memorial For Hells Canyon Dam

The Oregon legislature's memorial to Congress asking authorization of a high federal Hells Canyon Dam on the Snake River was killed on a 15-15 straight party line vote of the evenly divided state Senate.

The memorial passed the House 37 to 18 on Jan. 28.

Democrats argued people of the Northwest had issued a mandate for a high federal dam by electing high dam advocates to Congress and state legislatures.

Republicans denied there was such a mandate at the polls, declaring many factors besides the Hells Canyon Dam issue contributed to Democratic party gains in the Northwest.

Future Looks Bright For Hawaiian Utility

Hawaiian Electric Co. has reported record volume for 1956, raised its dividend rate, and also received first rosy reports from a Hawaii visitation of New York investment analysts, which it sponsored a month ago.

Eighteen analysts were brought to Hawaii at Heco's invitation to see not only Heco, but the Hawaiian economy which it serves, as preparation for Hawaiian Electric going into the market for financing for a $53,000,000 construction program.

First reports from the analysts to their clients indicated they found Hawaii and Heco had attractive investment possibilities with considerable future growth indicated.

Heco, meantime, pushed its quarterly dividend to 57½c for the first quarter this year, compared to 55c a year ago and 50c the year previous, both on a smaller number of shares.

Exploration Continues On Steam-Hydro Project

Pacific Power & Light Co.'s explorations of coal deposits on east and south sides of Eden Ridge on the Coquille River in southwestern Oregon were well enough advanced that some crews were shifted to the hydroelectric project in the nearby valley.

PP&L hopes to team a 100,000-kw or larger steam-electric plant fueled by the Eden Ridge fields with a hydro plant of at least 67,500-kw capacity.

The company's engineering department reports two of the diamond-core drilling rigs had been shifted off the mountain into the valley and had started field work on the dam site at the axis of the proposed structure. Site of the dam on the south fork of the Coquille River is about 23 miles south of Powers. The hydro plant would be located on the opposite side of Eden Ridge from the dam and would be fed by a tunnel through the mountain.

Steam Plant Favored By Washington House

Plans for construction of a steam power plant are finding favor with the same Washington State Legislature which may end the life of the public agency most actively promoting the plant.

The House of Representatives has approved, without a single dissenting vote, a measure which would appropriate $275,000 for a continuing study of the plant, including the preparation of plans. The Senate public utilities committee meanwhile gave "do pass" recommendations to bills which would abolish the State Power Commission, strongest advocate of the plant, and transfer its functions to the State Department of Conservation and Development.

If the commission is abolished, the $275,000 appropriation would go to the agency assuming its functions, or to a joint operating agency of the PUDs.

The commission, established in 1953, lost much public power support when it contested the right of the Grant County PUD to build Priest Rapids Dam on the Columbia River. Its foes contend that its elimination would save the state more than $100,000 during the next two years. The commission has conducted studies on construction of a steam power plant in the Roslyn-Cle Elum coal mining area.

DETROIT EDISON CUSTOMER — GENERAL MOTORS TECHNICAL CENTER

DISTRIBUTION TRENDS REPORT:

Automated Industry and phenomenal load growth challenge Detroit Edison's distribution planning

Over the last decade, Detroit Edison's industrial load has soared at an amazing rate. In Wayne County, for example, load rose 617%. At the same time, a trend towards locating industry in what had heretofore been farmland, like the site of General Motors' Technical Center, posed an unusual problem for Detroit Edison. For in addition to steel mills and other plants, among their largest customers are automated and semi-automated automotive plants. Their power requirements necessitate an uninterrupted supply of electricity at constant voltage and constant frequency.

Hence Detroit Edison became one of the first utilities in the nation to be confronted with a voltage dip problem of large magnitude. Providing their customers with "quality" electricity, and enough of it on time as load skyrocketed, was the challenge before Detroit Edison.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Here's how Detroit Edison met this challenge

DISTRIBUTION TRENDS REPORT:

User-utility tests, alert field force, and advance purchase of substation sites, help Detroit Edison provide "quality" power; stay on top of rising load

A combination of forthright moves has placed Detroit Edison ahead of its voltage dip and tremendous load growth problems. Expansion and additions to automotive, chemical, steel mills and other plants, plus the increasing use of automation, posed these problems for Detroit Edison.

HERE IS WHAT THEY DID ABOUT IT:

Voltage Dip — Detroit Edison was one of the first utilities to recognize voltage dip as a major problem because of increased automation in industry. Since there was no precedent set for its solution, they ran a series of comprehensive tests in user plants and determined that much responsibility for voltage control lies with machine designers and users. Control improvements were suggested, and in certain plants, General Electric voltage stabilizing transformers were recommended and used with great success. Another important measure was the installation of two 50,000-kva General Electric synchronous condensors to prevent flicker when a steel mill customer

IMPROVED POWER FACTOR and elimination of flicker is obtained with this 50,000-kva General Electric synchronous condensor. Detroit Edison's S. W. Luther, Ass't. Chief Planning Engineer; J. W. Miller, Ass't. Sup't., Substations; D. D. Chase, General Sup't., Electrical Systems; E. E. Radcliffe, station operator; G-E Sales Engineer, M. B. Lucas; and D. Shea, D.E.'s Area Foreman, discuss the condensor's performance.

EFFICIENT TRANSFORMER MOUNTING is evidenced by cluster of three 100-kva General Electric distribution transformers on one pole. Discussing it are: Detroit Edison's Wylie Groves, Chief Planning Engineer; General Electric Sales Engineer, J. Berka; Vaughn Andres, Planning Engineer, and John McCowan, General Sup't., Overhead Lines Dep't., both of Detroit Edison.

INTEGRATED PLANNING provides clue to Detroit Edison's highly successful operations. Here, E. R. Moore, Manager of Engineering; D. D. Chase, General Sup't., Electrical Systems; J. Berka, G.E.; Ass't. Chief Planning Engineer, S. W. Luther and Ass't. General Sup't., Electrical Systems, F. C. Pohl and W. F. Wetmore, Director of Planning and Project Engineering discuss mushrooming load.

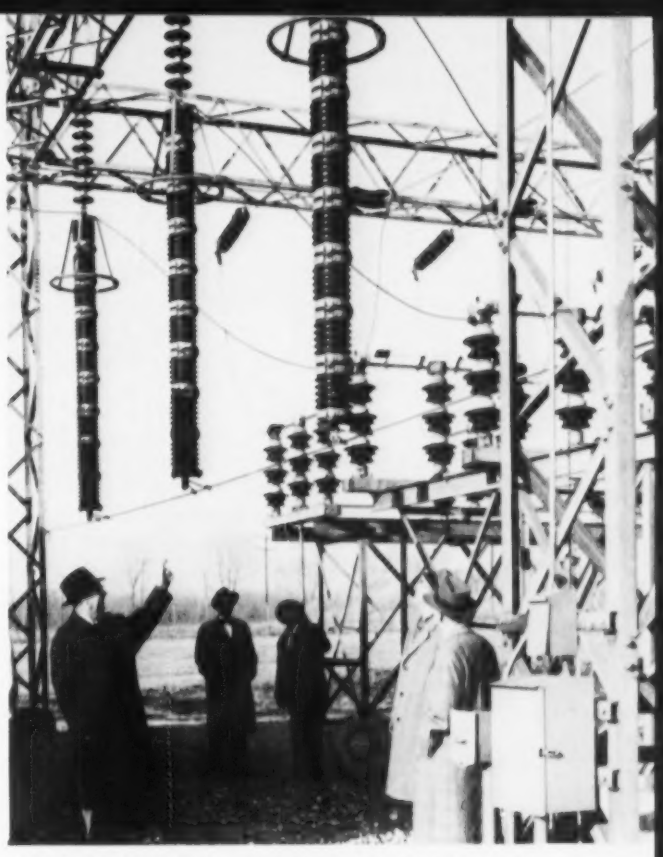
operated large electric furnaces. General Electric gave valuable application engineering aid in this move which safeguarded the quality of voltage going to residential and commercial customers in the area. Of course, Detroit Edison also gave particular attention to applying General Electric Magne-valve lightning arresters which helped alleviate lightning flashover, a major cause of voltage dip, whenever lightning or switching surges occurred.

Load Growth — Detroit Edison has utilized imaginative methods to cope with growing load. An alert field force observes local growth patterns and integrates their findings with the system planning and engineering sections. In many cases, D.E.'s field personnel work with users and suggest, with planning section recommendations, the best sites for new plants in terms of load.

In accordance with this operation, Detroit Edison is purchasing substation sites, occasionally as far as seven years ahead of their estimated need. As load increases to a level that requires building these stations, General Electric regulators and capacitors provide excellent service.

When You Specify General Electric, you take advantage of the latest advances in apparatus design, construction, application and the assistance of complete engineering services. To help utilities keep service running smoothly, highly trained General Electric service engineers plus a network of Service Shops stand ready to meet any and all maintenance and repair needs — day and night.

For Full Information on distribution equipment and Distribution System Services, contact your nearby General Electric Apparatus Sales Office. General Electric Company, Schenectady 5, New York.



MAXIMUM PROTECTION for the Jefferson substation's 120 kv line is afforded by these Thyrite* Magne-valve station-type arresters which allow up to 20% greater protection. L. to r., G-E Sales Engineer, M. B. Lucas; and D.E.'s E. Zavitz, Stations Engineer; W. O. Bramwell, Gen. Foreman, Operating Div., Substation Dep't.; C. E. Quick, Industrial Power Planning Engr.; A. P. Fugill, Chief Electrical Engr. *Registered trade mark of General Electric Co.

EXCELLENT STREET LIGHTING is provided by General Electric fluorescent luminaires. Lighting such as this is representative of a good part of Detroit Edison's commercial load.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Here's why it pays to see General Electric about your distribution problems

DISTRIBUTION TRENDS REPORT:

Product development at General Electric helps solve the voltage dip problem

The transformer development facilities at General Electric were able to assist Detroit Edison's customers in solving the problem of voltage dip lasting two or more cycles. This duration was sufficient to cause contacts to drop out on customers' control circuits in automated operations, shutting down their machinery and resulting in production and manpower losses.

General Electric voltage stabilizing transformers will maintain voltage at a level that will keep relays locked-in even though the line voltage may drop to 30% of normal for two to twenty cycles. A series of tests proved the value of these units, and they are now in successful operation in several plants served by Detroit Edison. This illustrates one of the major objectives of General Electric's research and development programs: to provide the electric utilities and their customers with apparatus to match the operating requirements of tomorrow.

When you specify General Electric, you get the benefit of General Electric Distribution System Services which include headquarters system planners — district application engineers and product specialists — extensive product development facilities — equipment installation and field service engineering.

These services offer assurance of maximum operating continuity, on-the-spot application help, equipment efficiencies, valuable help in system design and techniques. Get the full story from your General Electric Apparatus Sales Office. General Electric Company, Schenectady 5, New York.

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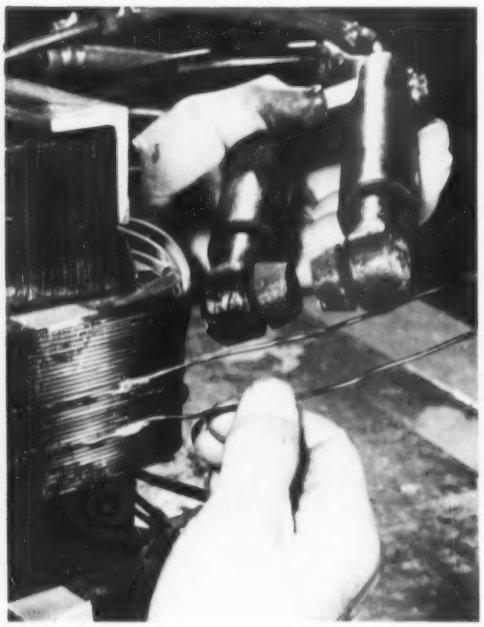
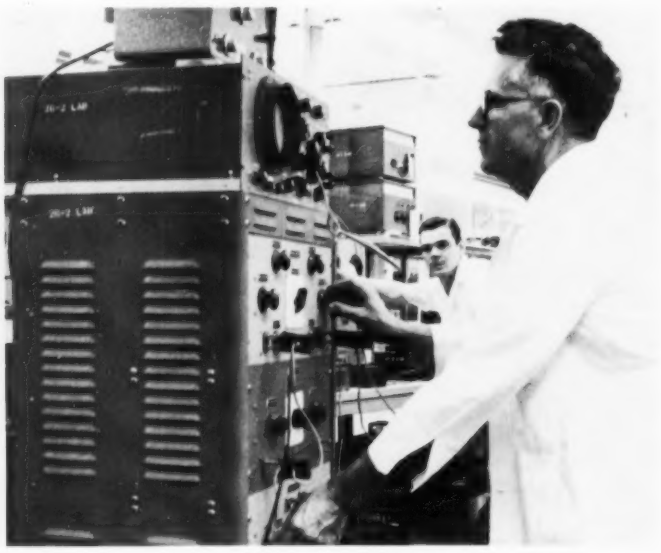




DEVELOPMENT FACILITIES at General Electric Specialty Transformer Lab in Fort Wayne are continually being enlarged to help utility customers solve transformer design problems, with particular attention to applications needing close voltage control.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Two Big Generators Planned by PG and E

Pacific Gas and Electric Co. plans to invest $83,200,000 to double the size of its new Pittsburg power plant, it was disclosed recently when the company filed an application with the California Public Utilities Commission.

Two generating units, 325,000 kw each, twice as large as the largest now in service on the PG and E system, will be added to the present 660,000 kw capacity of the plant.

The design also calls for the highest temperatures and the greatest pressures yet installed in a PG and E plant and the plant's gross normal operating capacity of 1,310,000 kw would make it one of the few in America with capacity in excess of a million kilowatts.

The new units, with boilers using oil or natural gas, are designed for 1,050° temperature and 2,400 psi pressure. They will be outdoor types, similar to the ones now in service at Pittsburg.

Wells Dam License Requested by PUD

Douglas County Public Utility District announced it is prepared to ask the Federal Power Commission for a license to build Wells Dam on the Columbia River upstream from Wenatchee, Wash.

Decision to apply for the license was made after a meeting of PUD commissions with representatives of Kaiser Aluminum & Chemical Corp. at East Wenatchee.

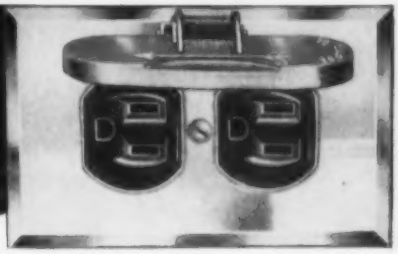
Previously the PUD received a report from Kaiser Aluminum stating that the $110,000,000 project is economically feasible. Kaiser Aluminum has been financing engineering work on the proposed project and has indicated readiness to enter a power sale contract with the district for part of the output.

The dam would have an initial installed capacity of 414,000 kw and an ultimate capacity of 483,000 kw. It would create a 28-mile reservoir extending to Chief Joseph Dam.

Kaiser Aluminum also has indicated plans to build an aluminum reduction plant in Douglas County if the dam is built.

• Trial operations for Pacific Power & Light Co.'s $23,000,000 Dave Johnston steam power plant at Glenrock, Wyo., are tentatively set for Oct. 1, 1958. The 100,000-kw plant was about 17% completed by mid-February, PP&L officials announced.

NEW! Exclusive! Different!



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Exclusive SNAP-COVER locks open for easy, one-hand insertion of plug . . . yet snaps shut at a touch for weatherproof protection. Lid does not rest on wire or plug. Can't damage insulation if cord is jerked out. *Cover cannot be loosened or pulled off.*

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Continued growth in the south county service area of Snohomish County, Wash., PUD No. 1 brought about construction of this new service and supplies headquarters and business office. Customer parking, pole yard and storage for transformers are some features of the facility. Other districts will have similar units

El Paso Says Expansion Will Double Capacity

A $45,000,000 expansion program for El Paso Electric Co., described by President M. V. Holik, will more than double the company's generating capacity.

Holik said the new construction is intended to pace the rapid economic growth of El Paso area.

"Rapidly increasing requirements of military installations and essential industries in our area," he said, "plus comparable increases in residential and commercial use of electricity, emphasize the need for the program."

The plan calls for 180,000 kw of new generating capacity, as well as 115 miles of new high-voltage transmission lines and other facilities. Present capacity of the El Paso system is 163,500 kw, 100,000 of which has been added since the end of World War II.

The new capacity will be added in three stages:

Two units of 50,000 kw and one unit of 80,000 kw, the last to be installed in late 1959 or early 1960.

Timber Price Unchanged In PP&L-State Dealings

The Washington State Land Board has declined to reduce its price to the Pacific Power & Light Co. of Portland, Ore., for 41,000,000 fbm of state-owned timber on land required by the private company for its Swift hydroelectric project on the Lewis River.

The Cowlitz County PUD, which has a partnership arrangement with Pacific Power, supported the request for a rate reduction but the board refused to budge.

The state appraised the lumber at $1,250,000 last December but the power company claimed this price was too high. Leonard Bennett, assistant vice-president, asked for a 10% reduction, to reflect the general decline in lumber prices. Any loss to the company would be reflected in higher rate structures, he said.

Land Commissioner Bert Cole, board chairman, contended the state should not have to absorb any losses resulting from timber market conditions, since the transaction was a "forced" sale.

Cheyenne's New Lights Mark Historic Event

Nearly 84 years to the day that Cheyenne, Wyo., streets were lighted as an experiment for an electric company's generating equipment, new style mercury vapor street lamps in a 25-square-block area were turned on recently.

The city, in cooperation with the Cheyenne Light, Fuel & Power Co., has installed 183 new mercury vapor lamps.

Cheyenne was one of the first cities in the country to install street lights. They were installed in 1873.

• The California Public Utilities Commission has denied petitions asking it to rehear the case in which it approved lease and maintenance to the public of private mobile communications systems by The Pacific Telephone & Telegraph Co. as a public utility service subject to regulation by the commission. Petitioners for rehearing included the city of Los Angeles and some 15 mobile radio installation and service firms.

British Columbia Firm Builds Turbogenerator

Construction of an $11,000,000 natural gas-powered thermal-electric plant at Port Mann, B. C., is being started by British Columbia Electric Co. The project has been approved by the Public Utilities Commission.

The plant will operate on the same principle as a turbojet aircraft engine with superhot gases being applied directly to turbine blades of the four generators.

It will be located at Cambridge and King Streets in Port Mann. Clearing of the site has already been started.

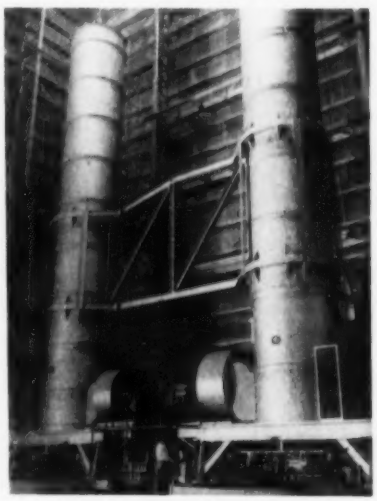
The completed thermal plant will complement the hydroelectric system during critical water years. It will also supplement hydroelectric capacity in the event of unforeseen mechanical troubles in the winter months of peak demand.

Snake Project Delays Add Millions to Cost

A. B. Martin, management coordinator for Pacific Northwest Power Co., reports that delays on two proposed Snake River projects have increased their cost to $234,000,000.

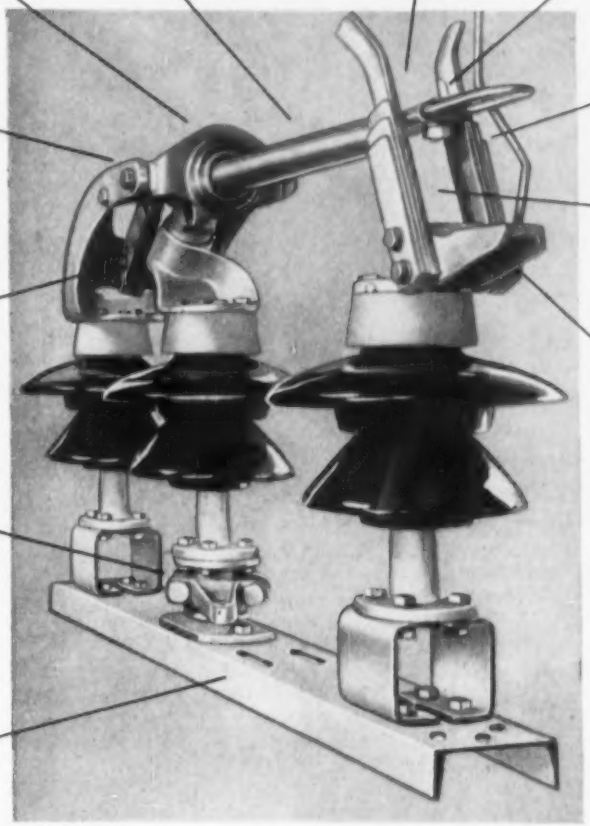
Original estimate for the Mountain Sheep and Pleasant Valley projects on the Snake River south of Lewiston was about $213,000,000.

The increase was attributed to steadily mounting construction costs.



Huge vertical heat treating furnaces, now in active operation at the Harvey Aluminum plant in Torrance, Calif., comprise a part of the large complement of auxiliary equipment designed for the production of heavy press aluminum extrusions

This unmatched combination of features proves it . . .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Sturdiest possible construction — built to outperform and outlast other switches.

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The sum of components produces an *unequalled* air switch . . . because, considering all features, the Delta-Star MK-40 stands out for its highly efficient, long, dependable service at low ultimate cost.

Other switches may look like the Delta-Star MK-40, but they do not necessarily perform the same. In such other switches, even minor changes in bearing centers, or an extra link in the mechanism only introduce needless complications and small parts that may detract from top performance.

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TYPE M

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10M
6M
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New **HIGH-STRENGTH STRAND** *developed by Copperweld research*

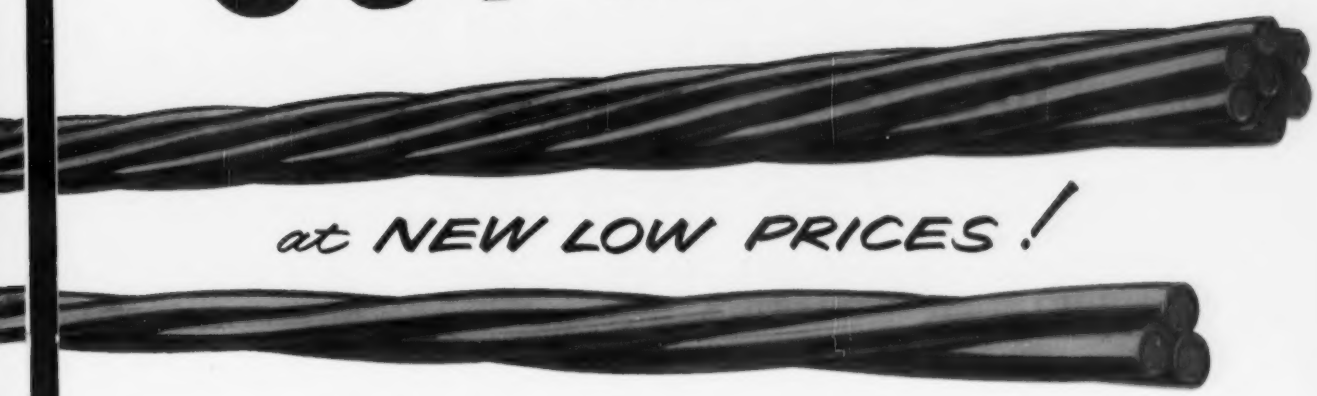
New **STREAMLINED TECHNIQUES** *for guy strand production*

New **ECONOMY**—*lower first cost, lowest over-all cost*

The SAME **PROVED DEPENDABILITY AND LONG LIFE..**

GUY STRAND since 1915...

GUY STRAND



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Now, with the new Copperweld Type M Guy Strand, first cost, too, has been reduced all along the line. The new low prices are the result of two recent Copperweld developments: a new, high-strength strand made especially for guy use, and new guy strand production techniques. And you still get the same long life, the same freedom from maintenance, because Type M Guy Strand is still Copperweld—each wire has a thick copper sheath inseparably molten-welded to an alloy steel core.

Copperweld Type M Guy Strand is available in 5 strengths: 2.2M, 4M, 6M, 10M and 16M. Pliable and easy to handle, it can be readily bent, served, moused or clamped. And, because of the molten-weld, the copper covering will not crack, flake or peel.

Our field engineers will be glad to tell you all about this new product, its convenience, and how you benefit from the new low prices.

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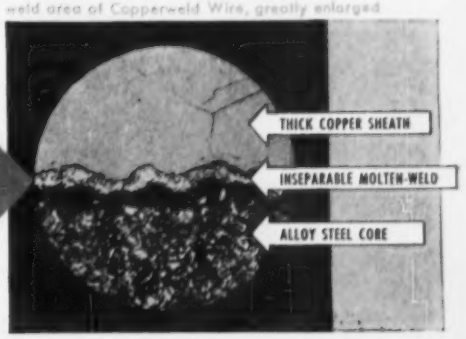
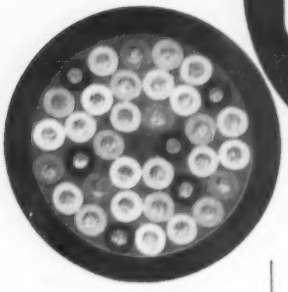


NOW!

BRONCO 66 CERTIFIED

CONTROL CABLES



WITH UP TO 36 CONDUCTORS

BRONCO 66 CERTIFIED CONTROL CABLES are made with the tough, flexible, oil resistant, Synchro-Cured Bronco 66 jacket that is certified to contain not less than 67.32% Neoprene. Jacket is branded every two feet.

There are three types of Bronco 66 Certified Control Cable—extra flexible portable cable, shielded portable control cable for electronic circuits, and "stationary" for important control circuits. In the stationary type there is a color-coded Neoprene jacket over each single buna-rubber insulated conductor.

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NEW FREE CATALOG CONTAINING A COMPLETE LISTING OF BRONCO 66 CERTIFIED CABLES:

WESTERN INSULATED WIRE CO.
Los Angeles 58, California

Please send me your new free catalog of wires and cables.

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Los Angeles 58, California

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ORIGINATORS OF TREE SURGERY

Bids and Contracts

- Ansaldo-San Georgia Co., Genoa, Italy, will supply a 26,250-kw hydraulic turbine for British Columbia Power Commission's Ash River development on Vancouver Island. Price is $235,542.

- S. Morgan Smith Co. has received a contract to rebuild three turbines for Seattle City Light. Power output of the units will be boosted to 45,000 hp each from the present 37,000 hp. The units are in Seattle's Gorge power house.

- E. V. Lane Corp., Palo Alto, Calif., has submitted the low bid for first construction work on a second power plant at Fort Peck Dam. The bid is $2,794,115.

- Shea Co., Henry J. Kaiser, Morrison-Knudsen, Macco Corp. and Raymond Concrete Pile Co. make up the successful bidding group on a $36,644,556 contract for construction of the 11-mile Clear Creek tunnel. The tunnel is part of the Central Valleys Project, Trinity River division.

- Low bid for construction of Trinity Dam is $48,928,100. A group comprised of Guy F. Atkinson Co., M. J. Bevanda, Charles L. Harney Inc., Ostrander Construction Co., A. Teichert & Son and Treptke Construction Co. submitted the bid.

- Koppers Co. will supply eight silencers for installation at the Georgia gas turbine station of British Columbia Power Commission for $115,448.

- S. Morgan Smith Co. will supply seven 140,000-hp hydraulic turbines for the Rocky Reach Project of Chelan PUD. Amount is reported to be "well over $11,000,000."

- Hall Sloat Electric Co., Oakland, has received a $155,900 contract for an illuminated sign system on the Bay Area's East Shore Freeway. Contract was awarded by the California department of public works.

- Seven contracts totaling $1,710,052 have been awarded by Plains Electric Co-operative for expansion of its Algodones generating plant north of Albuquerque. Suppliers are: General Electric Co., power transformer; Federal Pacific Electric Co., oil circuit breaker; Lummis Co., surface condenser; Elliott Co., turbogenerator; Springfield Boiler Co., steam generating unit; Paciifc Pump Inc., boiler feed pumps; DeLavel Steam Turbine Co., fuel oil pump.

- Westinghouse Electric Corp., is supplying electrical equipment for

two mine hoists at Anaconda's Ryan Shaft, Butte, Mont. Each installation will include two 3,000-hp, 600-v, d-c motors powered by two 2,500-kw generators driven by a 7,000-hp synchronous motor.

• Allis-Chalmers Mfg. Co. will supply an impulse-type hydraulic turbine for the Green Springs plant of the Bureau of Reclamation. The plant is near Ashland, Ore.

• Westinghouse Electric Corp. has received a Sacramento Municipal Utility District contract to supply two transformers for Hedge substation near Florin. Amount is $1,153,446.

Bonneville Awards

Bonneville Power Administration has announced the awarding of the following contracts:

• L. B. Read, Portland, $107,688, for construction of Chenoweth substation and control house north of The Dalles;

• Northwest Electric Supply Co., Portland, $134,936, for suspension insulators;

• Southwire Co., Carrollton, Ga., $92,393, for control wire;

• Motorola Communications and Electronics, $24,002, for carrier terminal for trip relaying;

• Power City Electric Co., Spokane, $107,760, for dismantling 230-kv series capacitors at Chehalis substation and installing them in Hot Springs substation;

• Power Line Erectors, Spokane, Schedule I, $236,570; Key Construction Co., Tacoma, Schedule II, $405,492, both for construction of the Alvey-Reston 230-kv transmission line, Drain Tap Point-Rice Hill and Rice Hill-Reston sections, and miles one to five of the Reston-Fairview 230-kv transmission line.

Engineers Awards

The Corps of Engineers has announced the following contract awards:

• Jim Kelley Construction Co., The Dalles, $8,955, for construction of drainage ditches, access roads and right-of-way and sand fencing in The Dalles Dam project area;

• Glenn Dusky, Moses Lake, $28,950, for construction of drainage and shoreline improvements at Lookout Point and Dexter Dams;

• Johnston Pump Co., Pasadena, $9,494, for design, manufacture and delivery of one turbine or propeller-type pump for experiments by the Oregon State Fish Commission in the Lookout Point reservoir.

TODAY more than ever—

Revere ELECTRIC MFG. CO. CHICAGO, U.S.A.

HINGED POLES

Remain Unsurpassed in UTILITY and EFFICIENCY

They do away with Risky Climbing

They eliminate expensive elevating equipment

Save dollars because Floodlights can be serviced from ground

The Greatest Boon to Easy Maintenance — and, easy maintenance promotes more frequent cleaning of Floodlights

199-E Square Tapered Pole in 20', 24' and 30' mounting heights

300 Series Round Pole in 20' and 24' mounting heights

800 Series Street Lighting Type in three mounting heights

A Revere First

Introduced over 25 years ago

— and, more desirable today when competition demands highest efficiency in outdoor lighting.

Cor-Ten Heavy-Duty Pole will handle 180 lbs. of Floodlights

THE PATENTED WIRING ARRANGEMENT THROUGH THE HINGE PIN on which the success of **REVERE HINGED POLES** is based. Note: Wire lays flat when Pole is down—no perceptible movement of wires.

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Available in Canada thru Curtis Lighting, Ltd., Leaside, Toronto, Ontario

THE ONLY COMPLETE LINE OF LUMINAIRES - FLOODLIGHTS AND POLES FOR STREET - SPORTS AIRPORT - SERVICE STATION - OUTDOOR THEATRE - MARINE AND INDUSTRIAL LIGHTING

NOTES ON THE TRADE

• **Lavern L. Allen** is a new sales representative for General Electric conduit products in the Northwest district, with headquarters in Seattle.

• **Eichorn & Melchior Inc.** is now a franchised distributor of General Electric's magnet wire, portable cords and electronic and aircraft wire and cables.

• **Carl S. Long** is the new Denver district sales manager, lighting division, for Sylvania Electric Products Inc. He replaces Bill Lounsbury who is now Kansas City sales manager.

• **John R. Anderson** has been selected to head up the new Salt Lake City office of Electrical Specialty Co. Address is 2588 Simpson Ave.

• **Donald R. Watson** is the new sales representative in northern California for Moe Light and Star Light divisions of Thomas Industries Inc. He will headquarter in San Francisco and cover northern California from Fresno to the Oregon state line, and northern Nevada.

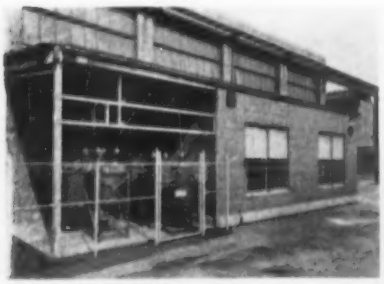
• **Earthmovers Equipment & Supply** Inc. is now sales representative for Yale & Towne industrial lift trucks in the San Diego area. Service work will be done from the representative's facilities at 6029 Fairmont Extension.

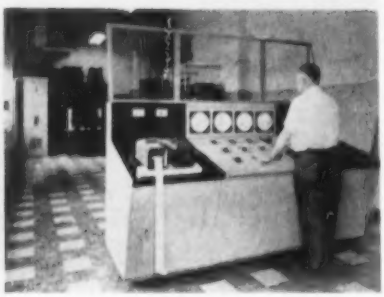
• **Anaconda** Co. is planning to build a pilot plant for producing alumina from clays found in the Pacific Northwest. If the plant proves successful, it will be followed by a full-scale operation near clay deposits at Moscow, Idaho.

• **Electric Specialty** Co. has opened an office in Phoenix at 210 W. Adams St. in order to give more complete coverage of the territory. William Smith will work from the office, which is under the supervision of the company's Los Angeles branch. Telephone number at the new office is ALpine 2-2107.

• **G. A. Walley** has been named engineer in charge of the new Alhambra, Calif., mnaufacturing facilities of Panellit Inc.

• **Harold M. Stiles** has been named Western regional sales manager of Yale Materials Handling Division, Yale & Towne Mfg. Co.





The four scenes shown here show different parts of the new low-voltage test laboratory of Federal Pacific Electric Co. at Newark, N. J. Upper left is the outdoor substation serving the lab. Upper right shows test station with a type DMB air breaker for control and back-up protection and 1,200-amp heavy-duty spring loaded closing switch. Lower left shows Paul M. Christenson, director of research and development for FPE's low-voltage products, inspecting contact structure of DMB low-voltage air breaker after a series of tripping tests. Lower right shows control console designed to provide the technician with flexible control of test programming. Results are indicated on meters; recorded by oscillographs and cameras

Belloni

Westinghouse Opens Distribution Center

A Pacific Coast distribution center has been opened by Westinghouse Electric Corp. at Ogden, Utah, for faster distribution of appliances and apparatus and other products of the company.

Appointed as resident director of the new center and Pacific Coast manager of distribution is Joseph C. Belloni, former Pacific Coast order service manager.

The two buildings, leased from the U. S. Navy, have a total of 240,000 sq ft. The center will employ about 100 people.

• **Edwin L. Weigand Co.** has purchased controlling interest in Meg-A-Therm Corp., Los Angeles, manufacturer of tubular electrical heating elements. Meg-A-Therm will now be known as Pacific Chromalox, and will be located at Gardena, Calif.

• **Proto Tool Co.** has announced three changes in personnel assignments. Nelson Bartoo is now director of contract sales; Richard E. Reich is product sales manager and Frank E. Hutton is director of research and development.

• **Graybar Electric Co.** announces the appointment of H. L. Jones as assistant to the district financial manager at Los Angeles and K. R. Andersen as assistant to the district financial manager at Richmond.

• **Wade Robbins** is now field engineer at Los Angeles for Globe Lighting Products. He was previously a district manager for the California Electric Co. of San Francisco, was once with Square D Co. in San Francisco and Valley Electric Co.

Sikorsky Aircraft's "Plant of the Year"

WIRE BY PHELPS DODGE

This spacious new helicopter plant recently built by Sikorsky Aircraft, division of United Aircraft Corporation in Stratford, Conn., covers nearly 18 acres and can easily be expanded to meet future production needs. A model plant in every respect, it has been cited by *Factory Management & Maintenance* as one of the top ten in the nation for 1956.

One of the requirements for this outstanding Sikorsky plant was an electrical system of the highest quality. That's why Phelps Dodge building wire and cable were installed.

On every wiring job where top-quality performance, expert workmanship and experienced "know-how" are called for, *it pays to rely on Phelps Dodge and your Phelps Dodge distributor!*

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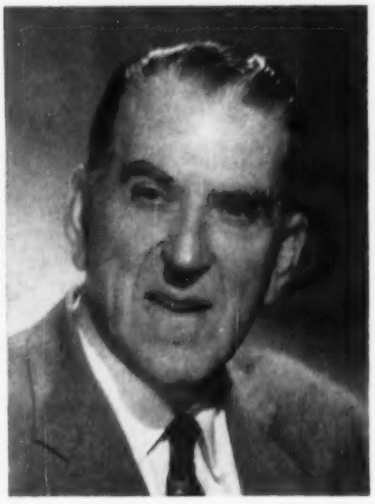


Schmutz

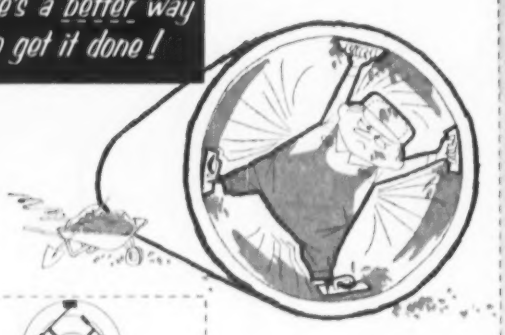
• **Charles O. Schmutz** has retired after 37 years as a salesman for the Graybar Electric Co. of Seattle. A dinner sponsored by fellow employees was held at the Washington Athletic Club in honor of Schmutz, and he was given an outboard motor on the occasion. Schmutz was a teammate of Casey Stengel on the Brooklyn Dodgers in the days of World War I and has maintained an active interest in baseball. He is a director of the Seattle Rainiers and works with American Legion and sand-lot ball teams.

• **"Recloser Reasoning!"** is the title of a new Line Material Industries movie available on loan. The 16-mm sound and color film describes how and why Kyle type R automatic oil circuit reclosers provide effective electric distribution system protection. Engineering and design features are explained. Contact a local L-M representative.

• **Richard Deane** has been appointed chief electrical engineer of the Consolidated Mining & Smelting Co. He joined Cominco in 1934 and served in several parts of the company's electrical operations. He became electrical engineer of West Kootenay Power & Light Co. in 1948 and held that position until his present appointment.

• **Cape Asbestos** of London and its American subsidiary, North American Asbestos Corp., Chicago, are planning a 50,000-ton (annually) mill and 10,000-ton fiber plant at the Can Carlos Apache Indian reservation near Globe, Ariz. The Globe area asbestos is said to be low in iron content and therefore applicable for electrical insulation.

there's a better way to get it done!



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PIPE LININGS Inc.
2414 East 223 St. (P.O. Box 457)
Wilmington, California

• **Robert J. Wolf** has been appointed division manager of Kaiser Engineers, a division of Henry J. Kaiser Co.

• **Richard A. Davis** has been appointed personnel manager of Prescolite Mfg. Corp., Berkeley. His responsibilities will include the company's plant at Neshaminy, Pa.

• **J. H. Buehler,** a member of the Colorado River Commission and consulting engineer for the Lincoln County Power District, Nevada, has retired from his position as general manager of Bristol Silver Mines Co. He planned and supervised construction of Lincoln County's first diesel electric plant and distribution system 25 years ago.

• **Sylvania Electric Products** has started construction on an 18,000-sq-ft addition to its microwave tube laboratory at Mountain View, Calif. The addition will house 125 members of the engineering group.

• **Howard H. Bullock** has been appointed manager of user industries sales for the Pacific Northwest district of General Electric's Apparatus Sales Division.

• **C. A. Peterson Co.** has been appointed general sales agent for Honeylite, a product of Hexcel Products, Inc., in southern California, southern Nevada and Arizona.

• **Lawrence M. Lyons** is now Western manager of the utility-industrial division of Burndy Corp. It is a new position. Lyons was formerly manager of the company's West Coast plant at Lynwood, Calif.

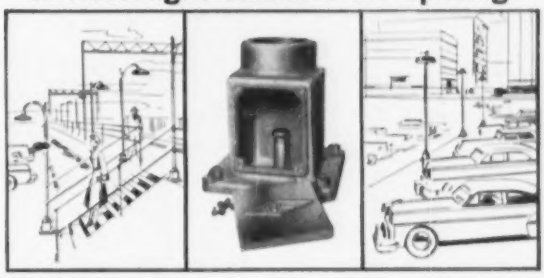
• **Jack Walter** has joined the sales organization of Hyde Sales Co., Denver, to handle distributor and industrial sales for Hyde Engineering Associates Division. He leaves General Electric Supply Corp. in Denver.

• **Wheelco Instruments** division of Barber-Colman Co. has added Hyman Hacker and Shelton Cashbaugh as sales engineers at Los Angeles, and Robert B. Sanquist as a service engineer.

• **G. H. Leland Inc.** announces two personnel changes in its Los Angeles office. George B. Isaacs is now Western district manager, and W. H. Moore is district office manager.

• **Charles H. Holland** has been appointed manager of industrial and transportation sales for the Pacific Southwest district of General Electric's Apparatus Sales Division. Headquarters are in Los Angeles.

A rigid support for cut-to-length pipe
A watertight chamber for splicing



COMBINED IN THE NEW HOPE METAL-PIPE BASE for your outdoor lighting jobs! Cut Standard pipe to length—thread it to fit the Hope Metal-Pipe Base and to take the lighting fixture—and you have a complete custom-made, low-cost lighting standard. Buy the components through your electrical wholesaler—assemble them yourself—install the standards for signs, signals, platforms and plant lighting jobs. Bases made for 2", 2½", 3" and 4" pipe sizes. See your wholesaler —or write us direct.

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2½" — H 42250
3" — H 42300
4" — H 42400

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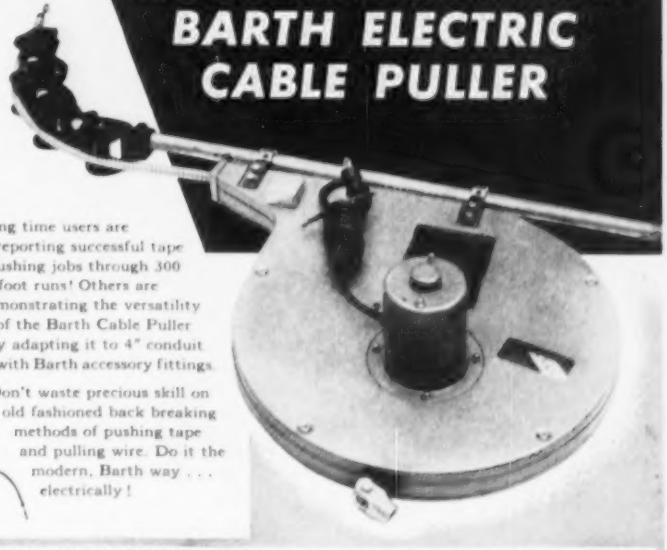
CHANGE HOURS OF TAPE PUSHING—CABLE PULLING TOIL TO MERE MINUTES OF QUICK WORK WITH THE
BARTH ELECTRIC CABLE PULLER



Long time users are reporting successful tape pushing jobs through 300 foot runs! Others are demonstrating the versatility of the Barth Cable Puller by adapting it to 4" conduit with Barth accessory fittings.

Don't waste precious skill on old fashioned back breaking methods of pushing tape and pulling wire. Do it the modern, Barth way . . . electrically!

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Please send complete Cable Puller Data Folder and prices

NAME ..... YOUR COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

NEWS ABOUT PEOPLE

Two Executive Changes Made by Colorado Firm

Public Service Co. of Colo. has announced two executive appointments.

O. P. Reed, vice-president and general manager of Cheyenne Light, Fuel & Power Co., has been appointed manager of employee relations for Public Service, and Paul E. Brookover will succeed Reed at Cheyenne.

Reed has been with Public Service Co. since 1919 and has served in successively more responsible positions leading to the Cheyenne managership appointment succeeding the late Hugh Lenhart.

Brookover joined the company in 1931 immediately after graduation from Kansas State College. He leaves a position of manager of the company's division commercial activities.

Burke Is President Of Pacific NW Power

John J. Burke, Butte, Mont., banker, has been named president and director of Pacific Northwest Power Co. He succeeds Kinsey M. Robinson, president of Washington Water Power Co., who was elected chairman of the board of directors.

Vice-presidents of PNP are J. E. Corette, president of Montana Power Co.; Paul B. McKee, president of Pacific Power & Light Co.; and Thomas W. Delzell, chairman of the board of Portland General Electric Co.

Personnel Changes Announced by Puget

Puget Sound Power & Light Co. appointments announced include the election of Ralph Stormans, Olympia grocer, to the board of directors to fill a vacancy created by the resignation of J. N. Donovan.

George Artus has been promoted to superintendent of the Shuffleton steam plant to succeed Harry Waldorf, who retired after 27 years' service.

John King is now internal auditor, a vacancy created by the retirement of C. P. Heidinger last August.

New local managers are Larry Cheetham, Central division, and Bill Heidergott, Southern division.

Brookover

Reed

• **J. K. "Ken" Cummings** has been appointed power supervisor for Region Four of the U. S. Bureau of Reclamation. He transfers from Boise to Salt Lake City to assume the new duties. He will head up plans and development of operations of the Upper Colorado River system.

• **Merle Ebbe**, former district manager for Pacific Power & Light Co. in Kalispell, has been named assistant to the general superintendent at the company's Portland headquarters. He will be succeeded by Robert G. Gordon, presently manager at Tillamook, Ore.

• **William T. Campbell** succeeds Percy F. Kolb as Helena division chief accountant of Montana Power Co. Kolb is retiring after 40 years with the company.

• **William E. Stinchfield**, chief of the civil projects section, design branch, Seattle District, Corps of Engineers, has been assigned as resident engineer at Chief Joseph Dam.

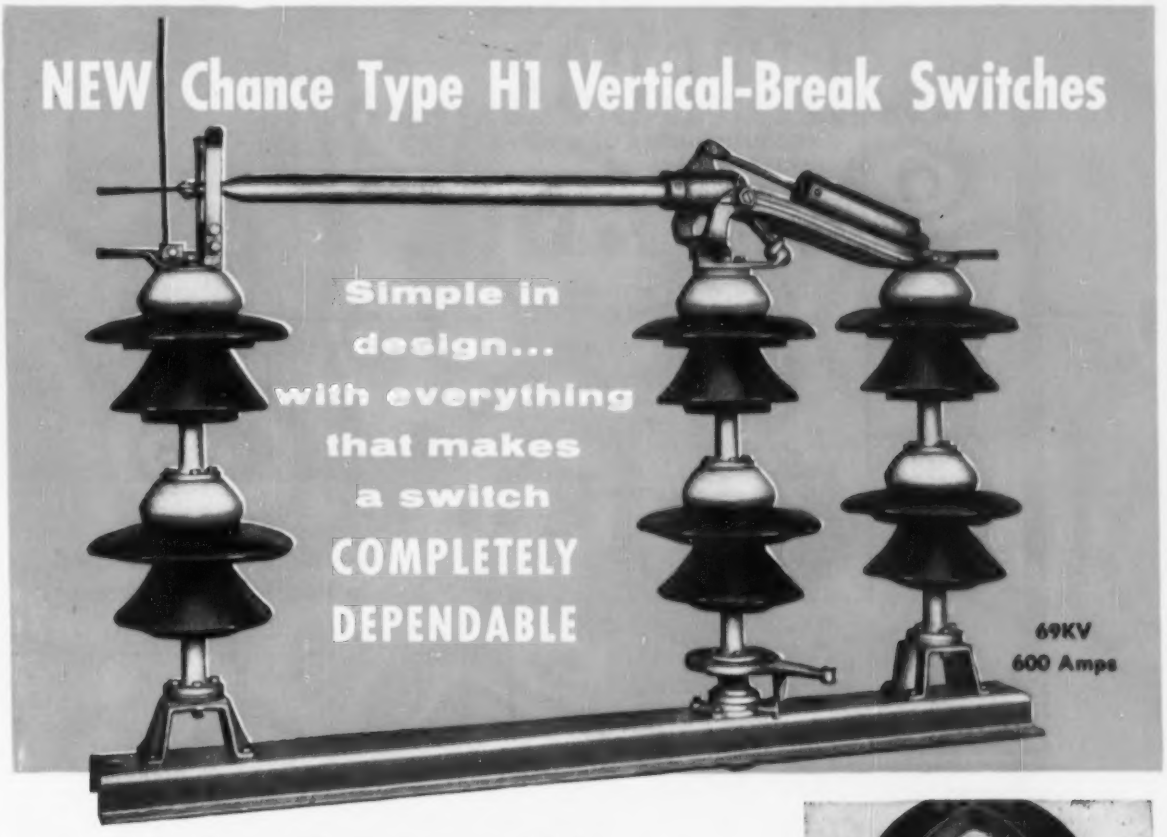
• **Dr. John Davis** has been appointed head of the research and administrative control department of British Columbia Electric Co. at Vancouver.

Trayer

Sibbett

• **S & C Electric's** Western sales division has added William R. Sibbett and Frank C. Trayer to its staff as sales engineers. They will cover the northern California and Nevada territory. Sibbett was formerly with General Electric and Trayer with Westinghouse. Both have backgrounds in apparatus engineering and sales, and are graduates of the University of California. They will work from the Western division headquarters at 2525 El Camino Real, Redwood City.

NEW Chance Type H1 Vertical-Break Switches



Rotating stack...group operated...
7.5 through 69 KV—400—600—1200 amps

The design requirement for this new Chance Type H1 Vertical-Break Switch was to "give it everything, but keep it simple." The most critical engineer will agree that this has been accomplished in the new H1, that completes the most modern line of braidless switches—the Chance S (Side Break) the C (Center Break) and H (Vertical Break).

This design simplicity brings you a switch that is exceptionally easy to install and easy to operate, yet incorporates all the features power men want for substation and pole top switching. Features like:

- Silver to copper, self-wiping, high pressure, adjustable jaw contacts. Silver contact bars are brazed on the blade end.
- Silver to copper, sealed hinged contacts maintain continuous contact through complete operating cycle.
- Only 3 moving parts... for years of dependable performance in any kind of weather.
- Blade closes with rotating motion that makes clean, high pressure contact ...breaks ice formations with ease.
- Sealed main bearing assembly for continuous smooth operation.
- Coin-silver bars brazed on blade tip for positive current transfer.
- Braidless current path with sealed hinge contact and silver-to-copper jaw contacts.
- Field adjustments, if necessary, can be made without special tools.
- All parts easily accessible.

New Chance Type H1 Vertical-Break Switches meet NEMA and AIEE requirements.

C556-22

Cutaway view of hinge mechanism: Hinge contacts remain completely enclosed at all times ...protected from oxidation and corrosion. Pressure springs are beryllium copper.

Brazed-on silver contact bars extend from the switch blade to give lifelong positive contact.

To get your copy of the H1 Bulletin write:

ABC INDUSTRIES

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General Offices: Centralia, Missouri

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Write for the new LI-CO illustrated catalog and price list.

Union made by members of Local 3 International Brotherhood of Electrical Workers, A. F. L.

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Bergey

Deskin Bergey Promoted In Pacific Power Change

Deskin O. Bergey has been appointed an assistant general manager of Pacific Power & Light Co. with responsibility for the company's operations in the Oregon Coast division. He succeeds Lloyd W. Edwards who is retiring after 37 years in the electrical industry. Bergey has been with PP&L 22 years, mostly in the Northwestern division. He has been manager of the Coos Bay district since 1954, and will continue to make his headquarters in Coos Bay. He is president of the Southwest Section of the Professional Engineers of Oregon. Edwards started in the electric utility industry with the former Coast Power Co., Tillamook, Ore., in 1919. He joined Mountain States Power Co. when it acquired Coast in 1925, and joined PP&L with the Mountain States-PP &L merger in 1955.

• **G. O. "Lew" Pohl,** on leave from Tacoma City Light, has been appointed acting manager of the Lakeview Power & Light Co. which serves a suburban area south of Tacoma.

Deaths

• **Percy Wells Brown,** 69, retired treasurer of British Columbia Electric Co., died at Vancouver, B. C., recently. He was well known in investment and golfing circles, and had lived for many years at Shaughnessy Golf Club. He was a member of the Vancouver Electric Club, National Office Management Assn. and the Vancouver Board of Trade. He joined B. C. Electric in 1926 as a transfer clerk and was named treasurer in 1947. He retired in 1953.

MINERALLAC

PRODUCTS NOW CARRIED IN SAN FRANCISCO STOCK

"PULL-IN" COMPOUND No. 100. For Use on Rubber, Synthetic, Plastic or Lead Covered Wires and Cables.

"VOLT-TELLING" STATISCOPES. Pocket Type for all-around testing. Station Type with Periscope.

STEEL HANGERS for Cable or Conduit.

JIFFY CLIPS for hanging Pipe, Conduit or Cable.

BEAM CLAMPS Used with Minerallac Hangers.

MIN-A-CLIPS and STUD CLIPS—Designed for Installation Economy.

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420 Market St. San Francisco, Calif.

HOW TO ESTIMATE THE COST of any electrical job

This book is packed with time-saving methods that help you streamline your estimating procedures — give you the knowledge that means safer and more dependable bids. Covers everything from the selection and training of electrical estimators and the proper use of estimating tools to preparation of final bid sheets.

ELECTRICAL ESTIMATING
By Ray Ashley
Member, Chicago Electrical Estimators' Assn.
2nd Ed. 363 pages, illustrated. $8.00

Covers . . .
- estimating forms
- estimating tools and their proper use
- studying plans and specifications
- taking off quantities
- listing and checking material quantities
- checking completed estimates
- and many other practical subjects

CLEAR explanations, plus sample estimates and guides, show you how to handle lighting and power branch wiring —distribution equipment—overhead and markups —estimating special projects and residential wiring. Time studies and preparation of labor cost units are examined in detail.

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PROFILES

Carl L. Richey receives for Sacramento Municipal Utility District a bronze plaque and check for $500 as winner of a contest sponsored by General Electric Co. George T. Bogard, division manager, utility relations, right, makes the award. SMUD also won a trip to Europe for two, and Mr. and Mrs. Richey will take this. They are scheduled to leave New York May 5 and will visit England, France, Germany and Italy. SMUD raised average residential use of electricity to 3,065 kwh in 1956, an increase of 248 kwh over 1955

Second generation takes over as E. T. French, son of E. L. French, one of Sacramento's pioneers, was made president of Sacramento Valley Chapter, NECA. He received gavel from Bert Naylor of George Foss Co., president last year. At right is B. L. Slater, vice-president, from Folsom. Installation dinner was Jan. 25

League managers met in San Francisco just before the February PCEA meeting. From left are: Victor Hartley, PCEA; George Cain, Sacramento Valley Electrical League; Bert Reynolds, NCEB; Glen Logan, Los Angeles Electric League; Bill Johnson, Arizona Merchandisers Assn.; Clark Chamberlain, San Diego Bureau of Home Appliances

Nuclear reactor facility at General Electric's new Vallecitos Atomic Laboratory, Pleasanton, California

Ford's new $40 million assembly plant at Milpitas, California

One of P G & E's 128,000 new customers this year

More than a million new customers in the last ten years! That's the astounding growth of Pacific Gas and Electric Company (and Northern California—now with 6½ million population). To serve these new customers with low-cost gas and electricity, P. G. and E. has *tripled* its capacity with an investment of $1½ billion—the greatest expansion in the history of the industry. And we're still expanding.

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Some of the famous firms investing nearly $2 billion in Northern California plants since 1945

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- ...nville
- Chemical
- ...nois Glass
- ...Central Cali...
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- IBM
- U. S. Steel
- Johns-Manville
- Monsanto Chemical
- Owens-Illinois Glass
- Sylvania

International Business Machines' new manufacturing plant at San Jose, California

Northern and Central California—marketing center of the Golden West.

IBM: One of P G & E's 128,000 new customers last year

Actually, IBM is one of more than a million new customers in the last ten years. That's the astounding growth of Pacific Gas and Electric Company (and Northern California).

To serve these new customers, P. G. and E. has *tripled* its capacity, investing $1½ billion in the greatest expansion in the history of the industry. There's plenty of low-cost gas and electricity here for everyone.

Sooner or later you, too, will move to Northern California . . . to serve the great, growing western market from your own western plant. P. G. and E. will gladly furnish plant site information tailored to your needs. A full-color movie, "Golden Horizons," is also available covering Northern California's industrial opportunities, superb climate and living conditions. Write Industrial Development Department, 245 Market Street, San Francisco, California.

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- Westinghouse
- Ford
- U. S. Steel
- Johns-Manville
- Monsanto Chemical
- Owens-Illinois Glass
- Sylvania

Attracting new industry and payrolls to Northern and Central California

In a series of advertisements* highlighting this area's amazing growth, P. G. and E. invites more of the nation's industry leaders to locate plants in Northern and Central California.

P. G. and E.'s Industrial Development Department supplies "prospects" with vital facts on markets, raw materials, utility service and plant sites — all tailored to the exact needs of each industry.

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These are just a few of the ways P. G. and E. works to help continue the rapid industrial growth of Northern and Central California.

**Appeared recently in Fortune, Time, Newsweek, Business Week, U. S. News and World Report*

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